MANUAL

FOR

PHYSICAL MEASUREMENTS

BOYS

HASTINGS

A MANUAL

FOR

PHYSICAL MEASUREMENTS

for use in

Normal Schools, Public and Preparatory Schools, Boys' Clubs, and Young Men's Christian Associations

with

ANTHROPOMETRIC TABLES

for

Each Height of Each Age from Five to Twenty Years,

and Vitality Coefficients

WM. W. HASTINGS, PH. D.

Chair of Anthropometry and Physical Training in the International Young Men's Christian Association Training School, Springfield, Mass.

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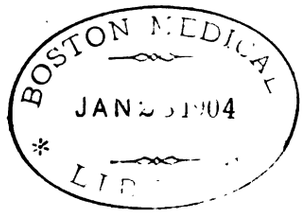

PREFACE.

The immediate object of this Manual is to explain the use of the accompanying Anthropometric Tables and the method of organization of observers for the physical examination of *large numbers of children.* The primary object of both Manual and Tables is propaganda of systematic physical training. They provide a practical form of examinations for large numbers of children, and used semi-annually afford a means of determining the effect of the long vacation period and of special forms of exercise upon growth and development. They provide approximate normal standards of development for all heights of each age. They form a ready means of determining the vitality of growing children and of sifting out cases which demand special examination and treatment at the hands of the physical director or medical examiner.

For my initial interest in the subject of public school physical examination and for suggestions as to method which their work has afforded me, I wish to acknowledge indebtedness to Dr. W. T. Porter and Dr. Luther Gulick. For helpful advice as to matter outlined in Chapter V., I am under obligations to Dr. George W. Fitz, Ex-Secretary of the A. A. A. P. E., and to Dr. James H. McCurdy of the International Young Men's Christian Association Training School.

For general review of the character and development of the material I am greatly indebted to Dr. T. M. Balliet. For painstaking assistance in the arduous labor of calculation of the data I am under special obligations to Mr. Elmer Berry, to my brother, Ernest E. Hastings, and to my wife.

Most of the material which forms the basis of the calculation of the accompanying tables I owe to the cordial coöperation and energetic personal supervision of Supt. C. G. Pearse of Omaha; a portion also to Supt. J. F. Saylor, now of Spokane, Washington, and to several other city superintendents of the State of Nebraska.

To Dr. Meylan of Boston and L. W. Allen of Hartford I am largely indebted for the material for ages seventeen to twenty.

For coöperation in the taking of the new shorter form of measurements for men, and for suggestions as to selection of measurements under "Special," I am indebted to Prof. Geo. B. Affleck of Iowa State Normal School, Dr. C. E. Ehinger of West Chester State Normal School, Dr. Page of Phillips Andover Academy, Prof. Lory Prentiss of Lawrenceville, Dr. N. Edwin Sanders of Cornell College, and to directors of various other institutions.

For the same kind of coöperation I beg to acknowledge indebtedness to physical directors in the Young Men's Christian Association, to Dr. Meylan of Boston, Dr. Welzmiller of New York City, Dr. Fisher of Brooklyn, H. L. Chadwick of Philadelphia, H. H. Wikel of New Haven, F. B. Barnes of Cambridge, to several of my old students of anthropometry in the International Young Men's Christian Association Training School, and to many other physical directors who are now following out the card system outlined in Chapter V.

Sincerely,

International Young Men's Christian Association Training School,
Springfield, Mass.

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INTRODUCTION.

The accompanying tables are representative. They are intended for use in public and private schools, boys' clubs and in the boys' department of the Young Men's Christian Association. There is a special word with reference to the propaganda of systematic physical training and of physical examinations throughout each state which will necessarily have more direct application to the interests of superintendents, principals, and teachers in public schools, as they are directly responsible for the larger part of this work. The point of view in the consideration of this subject will be that of the average state, as I am speaking to the largest number. In such a state, the State University is the centre and the stimulus of the whole public school system. This tendency to centralization of educational influence is attended with exceptional opportunities for organization of any advanced pedagogical movement. State organization will not be found so easy in older states, nor easily become so thorough and so complete, but by proper study of problems and adaptation to conditions in such states the matter of thorough organization may be approximated. Although the middle or western state is the point of view of this introduction yet the matter is sufficiently fundamental to be of interest to all.

PHYSICAL TRAINING IN PUBLIC SCHOOLS.

The reason for the almost universal lack of coherent system in the advancement of physical training throughout the United States lies in the lack of apprehension of some one of the various essentials which make up a complete system of work. No state has fully realized its official and individual responsibility for the promotion of effective and prevailing methods of physical training throughout its boundaries. Systems of general exercise, more or less successful, have been adopted in one section of a state, different forms have been adopted in another part; physical examinations have been taken in but few cities and mainly for general scientific purposes. The practical value of the measurements taken has been limited in scope to the promotion of interest in the subject and to the guidance of a very few investigators as to the form of *general* gymnastic drill best adapted to school children as a class. The intrinsic value of physical examination for the adaptation of exercise to the *individual*, as employed in university work, has been neglected and left undeveloped, largely, I believe, because a feasible scheme of dealing with such large numbers of individuals has not been brought to the attention of educators. It is this almost universal neglect which is responsible for the emphasis herein laid upon the growth and development of children, not primarily the fact that the introduction of general physical examination into public schools appears to be the very best initial means for the promotion of a vital interest in physical training. The object of the paper entitled "The Propaganda of Physical Education Throughout a State"* was to emphasize the first step in the movement,—that of organization for propaganda. This embraces the creation of the agencies which are to become responsible for the advance, the outlining of their campaign and getting up momentum. The outline of campaign necessarily involves a declaration of principles upon which it is the intention to proceed.

*This paper was prepared by the author for the "Congrès International de l'Education Physique," Paris, 1900; and appears in the December number of the American Physical Education Review, 1901.

I. Organization for Propaganda

Includes the organization, recognition and strengthening of the following agencies:—

1. State and local Physical Education Societies as branches of the A. A. A. P. E.
2. A State Intercollegiate Athletic Association.
3. A State Interscholastic Athletic Association.

1. The function of Physical Education Societies is to promote, through their statistical committees, the physical examination of the children in public schools of the state, to disseminate facts derived from these investigations, and to discuss the new problems raised by the increase of attention to the subject of physical training.

2. It is the business of the State Intercollegiate Athletic Association to inaugurate, to stimulate and to conserve clean athletics, and to promote solid preliminary training; to obtain the coöperation of leading college and university professors upon athletic boards, to secure the active interest of all, and the permanent exercise of their influence toward the preservation of clean athletic standards; to provide a guiding, fostering agency for high school athletics.

3. The State Interscholastic Athletic Association has the same, but a broader, more vital function from the fact that its influence is of wider range and that it touches growing manhood at a critical, formative period. The announcement of its purposes commands the immediate attention of superintendents and principals all over the state. The question is immediately raised, Why organize athletic and recreative work in high schools and preparatory schools? First, because the interest of the boys themselves is instantly secured; second, because games are found to be the life of all the best systems of physical training; third, because through their own inherent life they perpetuate themselves, and they not only do not demand nursing to preserve interest, but they even stimulate participation in other forms of development, especially those general body building exercises which prepare for competitive work; and, lastly, because recreative games are natural forms of exercise and the interest in them an expression of a normal physical appetite. Principals and superintendents are driven to the supervision of sports; their attention is compelled sometimes, even unwillingly, but when the attention is once fixed upon this problem any thoughtful educator is impelled to provide the proper oversight and preliminary body building which will prevent needless injuries; he is led to sift out the weaker candidates for teams, and from this, by an easy step, to the provision of corrective exercises for the weak and diseased and for the whole student body.

Boys will engage in recreative games whether we supervise them or not. By guiding them aright in their inception, the advantages accruing from their right conduct may be conserved. Physical vigor, physical and moral courage, self-control, sense of honor—in brief, all the traits of true manliness may be cultivated. In addition, one secures the confidence and personal loyalty of the boy himself through the exhibition of sympathy with his interests. Left to run themselves, athletics may produce exactly the opposite results, to the demoralization of the boy and the prejudice of well-disposed parents, teachers and school officers.

II. Organization for Systematic Physical Training.

There is no necessity for a labored defence of systematic physical training. Experience on every hand and for centuries argues for it—the argument of success from the ancient Greeks onward. The annually increasing congestion of population in cities and the ever consequent and persistent decline in the vitality of the racial stock argues for it—the argument of increased necessity. Sufficient evidence of the deleterious effect of city life is to be found in the fact that where a city family does not intermarry with country blood the family

We ought to consider, first, the advantages of physical training as set forth by its practical results; second, the grounds of its practicability; and, third, the grounds upon which the permanent value of physical education depends.

1. The Practical Results of Systematic Physical Training.

The benefits, muscular and neural, are in the nature of increase in the strength and size of muscles, strength and function of the vital organs, neural and muscular coördination and control, quick perception, physical judgment and courage.

The effect of systematic physical training upon character is definite and decided. It is productive of clearness of mental vision, coolness of judgment, self-control, moral courage, originality and individuality.

2. Practicability.

The ground of the expectation of success in the development of the various essential parts of physical training in public schools depends not upon the solution of any question as to whether the proposed methods have already proved successful, for the emphasis of each phase of work has been at some point the inspiration of a physical campaign which has been productive of great permanent advantage toward the securing of a better physical type. Practicability depends upon support, support upon vital interest. From the point of view of the physical director and of promoters of physical training, interest depends upon equipment, assistance, system and executive control; from the parents' point of view, upon their perception of the rational character of the exercise, physical examinations and prescription of exercise, and upon their recognition of permanent benefit; the interest of the pupils depends upon the apprehension of a rational and consistent method running through the whole scheme, upon the attractiveness of the exercise, upon the use of natural rather than an excess of formal gymnastics, and upon the vital interest and personal enthusiasm of the instructor.

One item of the foregoing appears to demand further comment, namely, "The attractiveness of the exercise." This is exceedingly important, inasmuch as the whole of the neural value of the exercise depends largely upon it. It is well known, of course, that a measure of brain rest may be secured by a change of attention, but perfect rest can be obtained only through entire relaxation of attention, through diversion. In this fact is to be found the chief reason for the general failure of some kinds of exercise to meet fully the needs of children in our public schools. Much of it is fair hygienic work, but does not meet the deepest physical need of growing boys, nor even of girls, without considerable modification. Such forms of exercise lack interest for American children because too formal.

3. The Permanent Value of Physical Training

Rests entirely upon one thing, *adaptation*—hygienic work and light recreation for the average student, corrective gymnastics for the weak or diseased, and athletics for the truly vigorous. There are systems upon systems of gymnastics (the term system is often a misnomer), all clamoring for recognition as the *one form* suitable for public schools—the German system, the Swedish system, military drill, and a countless horde of smaller systems termed Delsarte, "physical culture" (or movements for expression), Ralston health drills, etc., which rarely acknowledge benefit to be derived from any other methods. The German system is valuable for the educational features of its heavy gymnastics, the Swedish for its educational and corrective work, and military drill mainly for the correction of postural defects and for mental training in precision and in habits of obedience. The manual at arms has no corrective benefit, but tends to aggravate asymmetry. Mr. Herman Koehler, the master of the sword and instructor in gymnastics at West Point, says: "The use of the musket as a means of physical

development of any one, be he man or boy, is worse than useless; in my opinion it is positively injurious." The valuable elements secured through military drill may be obtained in a more satisfactory as well as more acceptable way to the student through suitable forms of hygienic and corrective work. The remainder of the list of systems demands no particular comment.

If the end sought be grace of movement, let Delsarte or some other movements for expression be adopted; if strength of muscular groups, let there be outlined exercises of resistance either by the use of weights or of opposing muscles; if it be correct carriage, let corrective gymnastics be given; and so on through the whole list of points of view for exercise. These things are all interesting to people and relatively valuable, that is to say, as systems they accomplish with some degree of success the end sought. But the most important matter to settle is the primary object to be sought. In the beginnings of this movement for exercise in public schools it is not possible to do everything that is needed, but only the most essential thing.

A true system of physical training must be eclectic as regards what are at present termed systems. It must possess certain broad but well-defined principles of adaptation of work to the great variety of individuals concerned. Prescription of exercise bears the same relation to physical training which therapeutics sustains to medicine; both are based upon physical diagnosis. If there be any difference in their ultimate purpose, physical training is more concerned with the prevention of disease than with its cure. A true system must apply these basal principles through the appropriation of that part of any system which is best adapted to the end sought. Since the primary need of public schools is not the development of muscular power and neural control, but of organic vigor, then the first need of children of the school age is purely hygienic work—exercise which develops primarily the strength of heart, lungs, and other vital organs; exercise which is adapted to the whole student body.

Physical culture, movements for expression, occasionally have a hygienic value; some forms of educational gymnastics are conducive to health and vigor; many corrective exercises are truly hygienic in so far as they secure normal position and carriage of the trunk, and provide a necessary basis for other hygienic work; recreative games and sports are typically hygienic and natural. The first effort in public schools should be the promotion of health. From the various types of exercise let those be selected which satisfy this vital necessity, let the emphasis be laid upon this ultimate end, and let this determine the balance to be preserved between the types of exercise given. The result will be a system of hygienic work, representative and effective.

Dr. McCurdy defines hygienic work as follows:—

"Hygienic exercises are those which necessitate the use of large groups of large muscles in moderate endeavors of strength, speed, and endurance. They eliminate exercises which call for great neural expenditure, that is, exercises of attention and those calling for new and complex coördinations. Pure hygienic exercises should require only the use of coördinations which have already been learned by the individual, or at least the progression should be slow and should use the types of exercise most basal in the organic and muscular development of the race.

"The leg and trunk groups of muscles are better adapted for hygienic uses than are those of the arms, for the following reasons:—

"1. They represent larger muscle bulk, and are therefore, when used, more stimulating to the organic functions.

"2. The neural expenditure is small in proportion to the dosage of exercise.

"4. In general, the larger the muscle mass and the coarser the movements, the smaller the brain area needed to govern it.

"5. Complexity of movement in the hand requires the use of large brain areas, while the coarser movements of the trunk and legs require comparatively small brain areas.

"Simplicity of movement, large dosage, the use of the large, coarse muscles with sufficient rapidity to produce perspiration and joyful exhilaration—these are the marks of hygienic work."

Hygienic work was first projected by the Young Men's Christian Association in the United States. They were driven to formulate this grade of work by their ideals. The gymnasium in the minds of the public at large at this period meant largely a place where a few individuals met to practice weight lifting, acrobatic feats and fancy movements upon bars, rings, and other apparatus. At first they met great hostility from the church in this matter of the introduction of the gymnasium. Through directors like Robert J. Roberts, Dr. Gulick, Dr. McCurdy and others, and through the influence of the International Training School as the centre of the movement, all forms of calisthenics, heavy apparatus work, and recreative work have been systematized and graded up to the production of one end, the health of the individual. They have been eclectic as well as creative, and have therefore drawn together the very best material for the production of this ultimate result.

Among hygienic calisthenic series Roberts' Home Dumb Bell Drill and Posterior Pulley Weight Drill, Gulick's Wand Drill, and McCurdy's Hygienic Dumb Bell Drill are the strongest outlines published. To Roberts, McCurdy and Meylan the subject of physical training owes the best outlines of hygienic work on the heavy apparatus. And for the contribution of outlines of educational gymnastics upon the heavy apparatus, the Young Men's Christian Association is indebted to the careful labor of Ehler, Wegener and Martin.

In the last analysis, however, the Young Men's Christian Association together with all other organizations who practice educational work on heavy apparatus must acknowledge its indebtedness to the polished performance of the German Turners, to the German system as a whole and to such able defenders of this system as Dr. Arnold of the Anderson School of Gymnastics.

Corrective work is of especial moment during childhood because of the greater plasticity of the organism. Swedish corrective work is invaluable here, though other systems may be used. The Swedish system is educational but its chief value lies in its rational corrective exercises. One of the ablest exponents of Swedish gymnastics, Dr. Theodore Hough, is responsible for the following statement of their assured place in the whole scheme of physical training:—

"In physical training two aims are preëminently important:—

"1. The general effects of bodily exercise, including the acquisition of that amount of physical endurance which the special conditions of each individual life demand. I place this first, for it is the chief end of physical training.

"2. Correction of physical faults, both deformities of the muscular and skeletal systems and deficiences in the nervous control of the body. I have tried to show that this is rendered necessary by the specialization of life, and is especially necessary with that specialization which marks the period of development, and which may be summed up in the two words, 'the school-desk.'

"The primary purpose of the Swedish system of gymnastics is the second of these objects." The Boston Normal School of Gymnastics and other leading schools have conserved and developed the very best of this Swedish system for public school use.

The basis of this work must naturally be physical measurement, diagnosis and the graphical representation of development upon anthropometric tables.

Recreative work. For this, playgrounds, athletic fields and indoor play rooms should be provided. It is valuable for its provision of brain rest and because of its power to increase the vitality. When conducted in the open air there is obtained the additional advantage of improved respiratory power and general tonic for the whole system. Almost the whole student body may be best developed during the larger part of the year by this work, but there must be *adaptation*, lighter games for girls and weaker boys, and vigorous games for the vigorous. The play instinct is universal. It belongs to the child and the savage alike. Perhaps they may be said to be at the same stage of evolution. But, however that may be, the desire of the muscular system for activity and of the nervous system for diversion is as real and valid as that for food. Function makes structure, lack of it, atrophy. The value of athletics and physical training in general upon morals requires no emphasis. This subject has been presented with such a solid array of facts by our most distinguished men in criminology and pedagogy as to put the whole matter beyond the range of cavil or dispute. Among those who have given much thought to this problem are Dr. Hamilton D. Wey and Dr. T. M. Balliet. The value of preliminary training for competitive sports and the necessity of solid supervision requires no further demonstration than the importance of the recreative work itself.

Successful *adaptation* of exercise can take place only through physical measurements, physical diagnosis, and the recognition of certain standards of development which have been secured from correct statistical methods. The recognition of certain general types of exercise as adapted to each nascent period aids in the successful outline of general class exercises. This adaptation rests with the character and basal training of the directors and instructors.

The permanent value of physical training itself, therefore, depends upon the broad and thorough preparation of these directors. This being the case, then—

Provide a man as director in a state university who is thoroughly grounded in the subject, prepared by a regular training school for physical directors in all the branches and details of his profession, not a gymnastic director, an athletic director, nor a medical director, but a man, school-trained, who combines the essentials of all these lines of work. He may not, often cannot, carry all of these; he may require, as assistants, an athletic instructor, an examining room assistant and a gymnastic instructor, but he should supervise them all personally.

Provide for such important fields as the important cities in the state a man equally catholic and solid in his views, that there may be perfect coöperation throughout the state.

Provide teachers of the state through a special collegiate course in the state university and state normal schools, and unify the work of the state.

An idea is abroad that any one who has been to some great university, and who can do a handstand or a back somersault, who can run a hundred yards, pole vault, or play foot ball, is a suitable person to guide the physical training of youth. There is another view that any one with a medical degree, who has studied the mechanism of the human body, is *par excellence* the man to put at the head of this sort of work. Both views display an entire misapprehension of the breadth and importance of the work. Even the physician is usually not prepared at all for the prescription of exercise, not to say further in the exercises themselves or in the principles which underlie the whole subject of physical training. The fields of medicine and physical training are entirely distinct and demand a distinct preliminary training. Between the two professions there should be the closest coöperation, but there is no need that one should tread upon the other, nor the purpose and scope of the one be confused with that of the other.

It is just as important that a physical director be thoroughly trained in a regular professional school as that a physician be required to attend medical college and present a diploma before he can be licensed to practice.

Lest my attitude should be misunderstood, let me say another word as to instructors. I do not mean that only physical directors, school-trained, should be allowed to instruct in this important branch in public schools, but I do mean that all teachers in a state should be prepared for this work as a legitimate and profitable part of their preliminary training in the state university and state normal schools. In larger cities the physical director should select and supervise all their exercises; in the smaller, superintendents and principals must be responsible for the character of the work.

Few of us have so much leisure that we are searching for new responsibilities and burdens, but looked at from the right point of view we already possess the responsibility. The serious part of the matter is that it is poorly fulfilled. There may be some compensation in the carrying of this new burden in the fact that it lightens the problems of discipline; there is certainly a strong one in the consciousness of doing one's whole work as an educator in the development of all-round character.

Some conclusions as to propaganda appear worthy of closing mention:—

1. Preliminary physical examinations of the children of a city, taken for the purpose of securing approximate standards of growth and development, will promote a solid initial interest in any city; are practicable for any city; are valuable for the indication of the norm, though taken without the removal of clothing; are sufficiently exact to become a trustworthy guide in corrective work; form a basis and an incentive for later and more scientific investigations by experts.

2. Regular physical examinations of children are practicable for any school twice a year, since, with sufficient instruments and under proper supervision, they can be taken by the teaching force *in one afternoon*. Through the use of M±D and the vitality coefficient they reveal to the teachers children who require attention from the physical director or a medical expert.

3. As soon as practicable each city should be provided with a physical director who shall have charge of the general hygienic work in city schools, determine the character and quantity of work to be given by teachers, and train them, where deficient, in the exercise to be given. He should be thoroughly equipped also to exercise the same supervision over all forms of recreative work on the playground, including what is generally known as athletics. He should give special attention to corrective work for the weak and diseased, and examine all cases noted by teachers, make a thorough diagnosis and prescribe exercise where the indications are that it will prove beneficial, and advise the parents where the aid of a family or city physician is needed. He should personally conduct the semi-annual physical examination with the aid of competent teachers and medical assistants.

In certain cities it has been deemed advisable to provide a medical visitor to make medical examinations and to assume the care of all pathological conditions out of the province of the physical director. His work has been largely to prevent the spread of contagious diseases, as well as to deal with parents respecting the use of drugs in the cure of diseases which are beyond the scope of physical training. The examination of all sensory functions may also be assigned to the medical visitor.

4. Special investigations should follow during the year or occur at the time of the semi-annual examinations, as soon as skilled assistants can be secured by the director. Examination of eyes and ears, special cranial measurements of anthropological value, strength tests of the legs, back, and respiratory muscles, and diagnosis of the heart and lungs are most important among further examinations possible without the removal of clothing.

5. In cities where there is no physical training, introduce general calisthenics, both free-hand and light apparatus work, into public school courses for one-half hour to one hour each day, even if such exercise must take place in the hallways or school rooms; in addi-

cial backing can be secured, provide a gymnasium with additional wholesome forms of exercise and have all forms of indoor gymnastics only in this room.

6. In order to provide carefully trained teachers in physical training throughout the state as demand is made for them, and also to secure a measure of uniformity in methods of training, a two- or three-years' course in physical training should be introduced into the curricula of the state university and the state normal schools.

7. Physical education must become an integral part of the whole educational system. University extension should become responsible for the propaganda of physical education throughout a state.

See "The Propaganda of Physical Education Throughout a State," Physical Education Review, December, 1901.

Physical Examinations in Private Schools and Boys' Clubs.

Most that has been said with reference to organization for systematic physical work in public schools is suggestive also in dealing with the problems of private schools and boys' clubs. There is a difference which we immediately recognize in the possibilities as to physical examinations. The practicability of more thorough and extended physical examination immediately upon the engagement of a well-trained physical director is one of the most prominent of these differences. For such preparatory schools and boys' clubs, however, the form of examination prescribed in this Manual has a distinctive value, that of sifting out special classes and cases which require attention. Immediate examination of all individuals upon entrance and at the close of the year is made practicable. It takes only two or three hours. It brings to notice the boys who are desirable candidates for athletic teams, and who can compete safely during the period which must elapse before complete physical examination can take place. It calls attention to others who are unfit, and who need special care and advice from the director. In most schools several weeks pass before all the boys are examined. In many cases two or three months elapse, and too often boys are allowed to compete upon athletic teams without the director having a thorough knowledge of their physical condition. The trouble may be exaggerated by overcrowding of the hours of the physical director with floor and field work at the beginning of the year, but it will always exist. The only remedy is to give the director the aid of fellow instructors, interrupt, if need be, the school program for two or three hours during the first week, get the general information needed, avoid endless uncertainty as to how to deal with this or that boy's constitution, and escape needless injuries from athletic sports. If this method is employed the director will not be encouraged in the tendency to hurry through and do slack work upon the later and fuller form of examination. (See Chapter V.)

The Boys' Department of the Young Men's Christian Association

In some respects presents a different problem. In many places it draws its membership largely from boys still in public and private schools. It will continue to do so after the public and private schools have realized and performed their whole physical duty during the time allotted to their influence, but the boy has a boundless capacity for physical activity, and almost an equal need. Besides, the Boys' Department stands, or should stand, for the provision of these same advantages for the vast horde of boys who drop out of school to become wage-earners after ten years of age. It should lay hold of them before the advantage of school training, limited though it be, has been entirely lost. Physical supervision should become increasingly thorough and intimate. The period of physical development covered by the Boys'

period as in those cases already discussed. There is also a definite need of a most thorough additional examination, involving the removal of clothing, at the leisure of the director during the year. (See Chapter V., Additional Tests.) The first form of examination can be taken by secretaries and other directors of boys' work, even if the institution is not provided with a physical director for boys, and cases demanding special attention can be sent to the "physical director for men," or to a physician, or to both, as the case may require. If there is a physical director of boys' work he will want to use both forms of examination in most cases. The first short examination will be required of all members, the second be given upon application or in special cases of need which have been noted during the first examination. This scheme of work means efficiency and economy of energy on the part of the director, and more general interest upon the part of the boys themselves.

Private institutions and individuals have been responsible chiefly for past progress in physical training. They have formed the body as well as the brains of the movement. But the time is not far distant when physical training will become an integral part of the whole public school system, when organization and equipment will be as complete as that for the teaching of arithmetic. It is a logical necessity, a compelled future fact. The majority of physical educators and members of the A. A. A. P. E. must eventually be engaged in public school work, for it is there we find the most vital of physical problems; it is there one deals with the plastic organism. The physical work of the Boys' Department of the Young Men's Christian Association stands next in magnitude and importance.

CHAPTER I.

VALUE OF PHYSICAL EXAMINATIONS.

The value of physical examinations during the period of youth and adolescence can hardly be overestimated. They are valuable from a hygienic point of view for the indication of the need and character of corrective gymnastics and general body building work; from the pedagogical point of view for the assurance they afford of the physical basis of mental efficiency, and of the fundamental value of physical exercise in the formation of character; from an anthropological and psychological point of view for the basal facts as to growth and development, and from the point of view of propaganda for the vital interest which they create in the whole subject of physical training.

One year of corrective work or general body building is worth more than two or three after the college age is reached. It is much more important that careful physical examination, prescription of exercise and regular physical training should be employed for children than for college men and women. The emphasis of physical work has been at the wrong end of the school system, but this error has not been confined to physical training. It has been characteristic of our whole pedagogical scheme. "As the twig is bent the tree is inclined" is no longer to the mind of the educator an idle aphorism, a passing sentimentality; it is not confined in interpretation to early religious impressions, but forms a basal principle of all education. Of late we have been taught to realize that the guidance of child life requires the very finest of minds, that the teaching of the elements of things demands the broadest intelligence, that the younger ages in public schools demand the cream of our teachers. But there is an additional reason for the early introduction of judicious forms of exercise into the life of the child. It is to be found in the fact that vital strength is rarely attained after the public school age, and then only by the most careful and persistent effort. The period of normal growth and largest development in size has practically passed and with it the time at which the vitality of the individual is largely determined for life. Slow intellectual development during early childhood is not so much an occasion for alarm as is arrested physical growth. There is no excuse for any pampering, "stuffing" system in promoting the mental development of the child. There is vital reason that the obstruction to normal physical growth should be removed. In most cases this can be done by proper physical habits, most prominent among which is outdoor exercise. With the increase of vital strength and normal physical function comes increased interest in things and power of attention. The stimulus of strong physical life wakes up the whole organism.

Physical Basis of Mental Efficiency.

Education can not be regarded as simply training of the mind, as the weight of emphasis in our public school system would seem to indicate; it can not be limited to training of the mind and moral nature, as the policy of many denominational schools and colleges might lead one to believe. Education must stand for development of power and function in the whole organism, for production of character. We do not train the child in parts or sections of his nature, but as an integral whole. He is not severally a physical, mental and moral child, but an individual who exhibits physical, mental and moral phases of activity. The body exists for the mind, but not as separate from it and used by it; physical functions provide the means of expression for intellectual activity, but they are more important as creative forces in the development of the normal function of the intellect and the will.

If you want to develop courage in a boy, let him play foot ball and other games which demand physical courage. If you want to develop the analytic faculty, let him have tennis, base ball, cricket, boxing, fencing, golf, or anything where accuracy of hand movement and physical judgment are paramount; or give him a good set of tools and reap the same educational results with somewhat less physiological benefit.

The demonstration of the physical basis of mental efficiency is fundamental to the production of an interest which will insure the introduction of systematic physical training and physical examination into the public schools, but this is not the strongest claim for the recognition of physical training. It is valuable for its own sake as well as for this borrowed reason; it is valuable because it is basal to the whole life of the individual, to the formation of character. There is no need to-day to attempt any proof of "the physical basis of mental efficiency." As Dr. Sargent remarks in the opening sentence of his paper on "The Place of Physical Training in the School and College Curriculum" (Physical Education Review, March, 1900):—"No one questions the value of a vigorous mind in a vigorous body, and most persons are united in the opinion that the best way to secure this desirable result is to give both body and mind a large amount of functional activity." For a fuller discussion on the subject, consult the above mentioned paper, also "Physical Basis of Precocity and Dullness," Dr. W. T. Porter (published by St. Louis Academy of Sciences), and a paper by the author, entitled "Anthropometric Studies in Nebraska," pp. 4, 5 and 6 (Physical Education Review, May, 1900).*

Basal Facts as to Growth and Development.

Another value derived from physical measurements lies in the conclusions of an anthropological or psychological nature which have resulted from careful statistical work. They form a means of determining normal standards of development, and a stimulus and guide to future investigation. A brief summary of conclusions from representative cities of the United States follow.

The earliest investigation of the growth of children in this country was made by Dr. H. P. Bowditch in Boston.

The most important results of the foregoing investigation may be enumerated as follows:—

1. The growth of children takes place in such a way that until the age of eleven or twelve years boys are both taller and heavier than girls of the same age. At this period of life girls begin to grow very rapidly, and for the next two or three years surpass boys of the same age in both height and weight. Boys then acquire and retain a size superior to that of girls, who have now nearly completed their full growth. This statement is based upon observations on several different races and in various conditions of life.

2. Children of American-born parents are, in this community, taller and heavier than children of foreign-born parents, a superiority which seems to depend partly on the greater average comfort in which such children live and grow up, partly upon differences of race or stock.

3. Pupils of American parentage at the public Latin School, private Latin School, and Massachusetts Institute of Technology are (apparently for similar reasons) superior in height and weight to the generality of boys of American parentage attending the public schools.

4. Pupils of the same selected schools are also taller and heavier than English boys of the non-laboring classes attending public schools and universities, the superiority in weight being, as a rule, more marked than that in height.

* Address delivered before the Physical Education section of the National Education Association, Los Angeles, Cal., July 12, 1899.

5. The relation of weight to height in growing children is such that at heights below fifty-eight inches boys are heavier than girls in proportion to their stature. At heights above fifty-eight inches the reverse is the case. (Vid. "The Growth of Children," Dr. H. P. Bowditch, Eighth Annual Report of the State Board of Health of Massachusetts.)

The following results are derived from the examination of children in Milwaukee by Geo. W. Peckham :—

1. Rate of growth is such that the boys are taller until the twelfth year and heavier until the thirteenth; between thirteen and fifteen the girls are both taller and heavier; after fifteen the boys excel the girls; girls nearly cease to grow when about seventeen years of age.

2. Children of purely American descent are taller than children of foreign-born parents; but children of German parents are heavier; Irish children are taller than the German; greater weight is due to stock or race.

3. School children in Milwaukee are taller than those in Boston; boys are heavier also, but girls are slightly lighter; superiority of height may be due to less density of population; the struggle for existence is not so severe; urban disadvantages are fewer in Milwaukee.

4. The height of American-born men is modified by density of population. Urban life decreases stature from five years of age on.

5. Growth of Germans is much modified by residence in this country through one generation. In intermarriage with Americans the offspring seems to take the height of the taller parent.

6. The sitting height in girls is less than in boys until the tenth year, and then greater till the sixteenth year. From fifteen to eighteen, sitting height in girls increases only two inches, but over four inches in boys. At fourteen the lower extremities of girls almost cease growing, while those of boys increase four inches between fourteen and nineteen. (Vid. "The Growth of Children," Geo. W. Peckham, Report of Wisconsin Board of Health, 1881.)

From the examination of school children in St. Louis, Dr. W. T. Porter corroborates largely the conclusions of Dr. Bowditch. He contributes also some very valuable material upon method of physical examination and statistical methods employed in the calculation of results. The following are some of the conclusions derived from "Physical Basis of Precocity and Dullness" (St. Louis Academy of Sciences, '93):—

1. The comparative rate of growth of dull, mediocre, and precocious children of the same sex is the same at all ages from seven to sixteen inclusive.

2. The acceleration in weight preceding puberty takes place at the same age in dull, mediocre, and precocious children.

3. The point in the period of accelerated development at which girls become heavier than boys is the same in the dull, the mediocre, and the precocious.

4. No child whose weight is below the average for its age should be permitted to enter a school grade beyond the average of its age except after such a physical examination as shall make it probable that the child's strength shall be equal to the strain.

In his "Growth of St. Louis Children," page 348, he advises the use of the following regulation: "That no pupil whose physical development varies more than $\pm D$ from the weight, etc., of the mean pupil of his height in a class which his mental output would otherwise entitle him to enter, shall be admitted to that class unless with the approval of a medical expert—if possible, a regularly appointed school physician who shall testify that the pupil's strength will be equal to the strain." (Vid. "Growth of St. Louis Children," Dr. W. T. Porter, St. Louis Academy of Sciences, 1894.)

Arthur MacDonald, Specialist in the Bureau of Education, contributes some additional

material upon the development of children in Washington, D. C., of which the following conclusions are representative:—

1. As circumference of head increases, mental ability increases.
2. Children of the non-laboring classes have a larger circumference of head than children of the laboring classes.
3. The head circumference of boys is larger than that of girls, but in colored children the girls slightly excel the boys in circumference.
4. Colored girls have a larger circumference of head at all ages than white girls.
5. White children not only have a greater standing height than colored children, but their sitting height is still greater; yet colored children have a greater weight than white children—that is, white children, relatively to their height, are longer bodied than colored children.
6. The pubertal period of superiority of girls in height, sitting height, and weight is nearly a year longer in the laboring classes than in the non-laboring classes.
7. Children of the non-laboring classes have in general greater height, sitting height, and weight than children of the laboring classes. This confirms the results of investigations by Roberts, Baxter and Bowditch.
8. Girls are superior to boys in their studies. Girls show higher percentages of average ability in their studies than boys, and therefore less variability.
9. Children of the non-laboring classes show greater ability in their studies than children of the laboring classes. This confirms the results of others.
10. Mixture of nationalities seems to be unfavorable to the development of mental ability.
11. As age increases, brightness decreases in most studies, but dullness increases except in drawing, manual labor, and penmanship; that is, in the more mechanical studies.
12. In colored children brightness increases with age, the reverse of what is true in white children.

Conclusions as to Children with Abnormalities.

1. Boys of the non-laboring classes show a much higher percentage of sickliness than boys of the laboring classes.
2. Defects of speech are much more frequent in boys than in girls.
3. Boys show a much greater percentage of unruliness and laziness than girls.
4. The dull boys have the highest per cent of unruliness.
5. Abnormalities in children are most frequent at dentition and puberty.
6. Children with abnormalities are inferior in height, sitting height, weight, and circumference of head, to children in general. (Vid. "Experimental Study of Children," Arthur MacDonald, Report of the Commissioner of Education, 1897-98.)

Conclusions from the examination of children in Lincoln and Omaha confirm the results of Bowditch and Porter. (Vid. "Anthropometric Studies in Nebraska," Physical Education Review, June, 1900.)

Some additional results from an unpublished paper by the author may be suggestive:—

1. Flexibility of the thorax is responsible for chest expansion more than is the size of the individual.
2. There is a period for boys between eleven and sixteen years of age when the flexibility of the thorax is greater than at any subsequent period, the maximum expansion occurring at fourteen years of age. Twenty-nine out of a total of fifty-seven were of this age.
3. After maturity is attained the tendency toward less mobility of the thoracic walls tends to arrest the increase of lung capacity and chest expansion, especially in individuals of

4. Large chest expansion is more frequently associated with large breadth of chest than with depth of chest or with lung capacity.

5. Chest expansion depends more upon increase in lateral than in antero-posterior diameter. This fact is indicated by breadth of chest taken during mean normal respiration, but is fully demonstrated only when breadth of chest is taken during full inspiration.

6. Large chest expansion is prevailingly associated with more than average height. Out of fifty-seven cases of very large chest expansion, forty-nine were boys above the mean height for the age. As far as the matter has been investigated the same thing has been found true of men.

The chest breadth for tall individuals is proportionately greater than chest depth. The lateral curve of the ribs is sharper than in shorter individuals. In harmony with the fact that other bone lengths are greater in taller individuals, it is probable also that the total length of ribs is correspondingly greater. Longer ribs aid in accounting for the greater chest breadth and chest expansion of tall individuals. In such individuals the tendency to comparatively shorter length of spine, taken with greater lateral diameter of ribs, combines to produce greater obliquity. Since by reason of the points of attachment of the ribs the respiratory movement is of necessity greater in the lateral plane, the greater the obliquity of the ribs the more pronounced the movement during inspiration, and hence the greater the chest expansion.

The following are a few statements on growth in height from Burk, secured through his comparative study of conclusions of various investigators (vid. "Growth of Children in Height and Weight," Frederic Burk, American Journal of Psychology, April, 1898):—

1. The average length of a new-born male infant has generally been taken as fifty centimetres (19.68 inches), and about a half centimetre less for females.

2. During the first year the child grows at the most rapid rate of its entire life. The average increase is probably between seven and eight inches. The rate of growth in this early period is practically the same for both sexes.

3. Between six and seven years the average American child measures about forty-four or forty-five inches.

4. At twelve years of age American boys are, on the average, fifty-five inches in height. On the whole it is perhaps safer to regard the period from six years to the prepubertal increase as a general decrease in rate of growth, with one or two minor fluctuations.

Mr. Burk's treatment is not valuable simply for its conclusions, but also and more especially for the grouping and actual citation of extracts from original papers. Take, for example, the topic "Daily, Weekly, and Seasonal Rhythms of Growth." "The chief contribution to this phase of the problem has been by R. Malling-Hansen, Director of the Deaf and Dumb Institute of Copenhagen xxx.

"The most important of Malling-Hansen's contributions is that concerning seasonal growths. From his careful measurements of about seventy boys for two years, and weighings for three years, he concludes: 'The weight of a nine to fifteen-year-old boy has three periods of growth during the year—a maximal, a middle, and a minimal. The maximal period begins in August and concludes in the middle of December, lasting, therefore, four and one-half months. The middle period extends from the middle of December to the end of April, four and one-half months. The minimal period extends from the end of April to the end of July, therefore three months. During the maximal period the rate of increase in weight is three times as great as in the middle period. Almost the whole weight gained in the middle period is lost during the minimal period.'

"Respecting height he finds similar rhythms of growth, a maximal, a middle, and a minimal period. 'The minimal period begins in August and lasts until the middle of November, three and one-half months. The middle period reaches from the end of November to

the end of March, about four months. The maximal period extends from the end of March until the middle of August, about four and one-half months. The daily rate of growth is two and one-half times as great, and that of the middle period twice as great, as that of the minimal period.'

"Approximately, it is to be observed that the period of maximal growth in weight—the autumn—is the period of minimal growth in height; and in spring and summer, while the body is growing most rapidly in height, it is actually losing in weight."

His paper is no less interesting upon "Growth in Height," "Individual Variations in Height and Weight," and "Factors of Variation in Growth."

Such conclusions as the foregoing, from representative cities of the United States, are valuable for the determination of various problems which are occupying the minds of superintendents, principals, professors of psychology and pedagogy, orthopedists, and, above all, the teachers who come face to face with the concrete problems in the children themselves. They have a peculiar and a professional value to the physical director from the fact that he must base any intelligent physical training upon these general conclusions derived from physical examinations. He must, or should, base his treatment of individuals upon correct knowledge of individual cases; he must take regular physical examinations and compare the development with certain standards of the normal established in other cities, where the calculation of the physical type has already been made, until such a time as the work of calculation of normal development in his own section becomes practicable as well as necessary. From the results already obtained at various points in the United States it is evident that the difference in development for the ordinary years of school life, five to sixteen years, is not very marked. The accompanying tables, showing typical development for each height for each age, can be used with much greater fitness for all cities than can the leading anthropometric college tables for various other colleges of the country, because individual peculiarities are exaggerated with the attainment of maturity. It is just as fitting to use for any city the large table containing typical development of each age for Nebraska children as to use age tables calculated in one part of the country for college men in other sections, because Nebraska is a representative state; but the height tables obviate almost entirely any difficulty which may arise from sectional differences in type, since the local differences in development correspond largely to the sectional differences.

For example, take a boy twelve years old in Omaha who is one hundred and thirty-eight centimetres in height; this is about two centimetres below the mean height for the age in Omaha. The *average* boy in some point, such as Jersey City,* would probably be about this height and have much the same development. (See table for age twelve at the end of this volume.)

There appears to be no valid objection to their both being plotted on the same height section for boys of height one hundred and thirty-eight centimetres on the table for age twelve. No better standard of development for an individual can be provided than that of the typical person of the same height and same age and sex. (Vid. Chapter III., "Anthropometric Tables.")

From the point of view of our present greatest need, the most important result which comes from general physical examination in a city is in the great quickening of interest in physical training throughout its limits. It is hardly necessary to dwell upon this statement. Enough has been said in the introduction and in previous papers. The taking of measure-

* New Jersey is among the states whose typical height is probably below the average for the United States. The above supposition is based upon Dr. Baxter's conclusions as to the physical development of recruits for the Civil War in his Medical and Anthropological Reports. They provide satisfactory standards of development for adults of a generation ago. Upon the development of such adults rests this illustration. In connection with a previous statement that differences between type in

ments not only educates teachers but that class above all others which is hardest to reach, the parents, especially where tables showing development of children are sent home and they have an opportunity to understand as well as to share the practical benefits of the investigation. The children themselves take the deepest interest in the examinations. At various times, when it has been my privilege to examine again in schools where examinations had been taken two years previously, boys have made eager inquiries about the former examination—asked me to secure it for them in order that they might compare the development indicated by the two examinations. The two most common questions at the first examination are, "Are my measurements good?" and "What sort of exercises must I take to make my measurements better?" There is no lack of interest aroused in physical training if one is willing to make the effort to arouse it. The method of advancement of interest in a subject by the application of local facts never yet has failed, and the more individual the application of the facts the greater weight they carry with them.

CHAPTER II.

MEASUREMENTS.

In the matter of public school examinations, we are at the same stage of development as that in which our great pioneer in physical training, Dr. Hitchcock, found himself over a quarter of a century ago in estimating the type or norm of college men and making a practical application of the results. The difference in situation lies in the great mass of facts at our disposal pressing to be delivered to the child and the parent at first hand. Enough facts exist to-day in scientific papers to revamp the whole school system as to physical training. In the confused attempt to grasp the whole mass of new scientific material and to make out its significance and application, in the division of energy which comes from division of attention amongst various matters about the child, the child himself is lost sight of. Apply a few of the simplest truths to him personally. He wants to know "how big" he is and how he can "become stronger" and be able "to become a winner" in the boy world about him. There must be some approximate knowledge of the laws of growth and development, and it must be put in a form capable of being understood by the average boy.

The recent increased attention to the study of the child psychologically and socially is indissolubly bound up with the study of him physically. This physical study must cease to be at arm's length, and like that of adults, in its application get down to the comprehension of the child himself and stimulate him.

If we waited for some truly learned investigators to formulate (as they would like) all the exact kinds of exercise adapted to the particular stage of the child's individual evolution, before introducing exercise into city schools, it might be one or two generations, or a century, before the perfect system is found It must grow, must be lived out, learned by practical attempts to teach it. The physiological effects of exercise must dictate the system taught, and these effects are to be learned definitely only through periodic physical examinations and the use of suitable anthropometric tables for recording results.

If we wait, as others would have us, until a complete system of sensory, motor and psychological tests can be introduced, involving all the investigations which we would like to prosecute, involving the answer to a great mass of truly valuable psychological and pedagogical questions, we shall have to wait another century for the "wherewithal" to prosecute with exactness and thoroughness these investigations. The most immediate and vital need is to give forth some simple, solid, fundamental facts to the parent and pupil, and to mould public opinion. Favorable public opinion means financial backing. This means equipment, instructors.

It is well for each investigator, in addition, to elect some single subject for original work, to go to the bottom of it and bring up something of permanent value to the whole pedagogical brotherhood.

It is clear that, since little time is available at present for physical matters in the time schedule of public and preparatory schools, the physical tests taken should be first *practicable*, *i. e.*, capable of being taken in the schools of any city with the assistance ordinarily available

I. Practicability of General Examinations Twice a Year.

The accompanying series of tables is designed to encourage the examination of large numbers of children twice yearly. For such general examination in public schools the time equation is the most serious. Many cities which have not introduced physical examinations into public schools have not been prevented from doing so from lack of interest, but from the impression that such investigation is not feasible, that it will require too great an expenditure of time and money. They have not reasoned altogether apart from experience, but that experience has not been complete.

A variety of things have been responsible for the impression of impracticability of physical examinations in city schools. Undue consumption of time may have resulted through the general method and supervision, through the number and kind of observers available, or through the character and number of the tests themselves. The "method" may not have been coherent, may not have studied economy of time or energy; the "supervision" may have been intermittent, may have been wanting in experience, may have lacked centralization—no one person has been responsible for the carrying out of the plans; the "observers" may have been of various kinds, inefficient or inharmonious, but the most frequent lack is not that of expert observers for the technical work attempted, but of enough of them with enough time to prosecute the examination rapidly. The busiest men are the men who have been sufficiently interested to give of their time, but they are most frequently practicing physicians or students, and their time is not their own. The vital root of the difficulty, however, has been the "number and character of the tests." It is desirable to limit the general examination to ten or fifteen measurements and tests. They should not be technical and difficult, or involve the use of delicate machines. It is evident that such work must consume time, and can be carried out only upon a limited number. This limited number can be sifted out during the process of the general examination and through the material derived from the general examination, and such special examination can come and should come as supplementary to the general examination.

The impression of failure in practical results which such investigations have occasionally made upon school boards has been due, largely, to the character of the tests and to the lack of continuity of effort. School equipment as to things and people has not been able to cope with the problems revealed by advanced research; they have not been able, even, to do thoroughly the physical work which has been indicated to us clearly for the last quarter of a century by investigations in comparative height and weight. What we need in public schools is a simple form of examination which can be taken at least twice a year without inconvenience, and which will form the basis for exercise and show the effect of the exercise taken during the year. In the beginning, and for many years to come, such an examination must have the following characteristics of practicability,—that the measurements be few in order that they may be taken in a short time, that they may be simple and involve the use of simple instruments in order that they may be taken with facility by teachers after slight training, that they be such as can be taken without the removal of clothing, and that they be homogeneous in order that they may be easily grouped, the change from one to another be easy, and above all that one vital purpose may run through them all, and something definite be accomplished because that something was intended.

The best argument, however, is that of experience. The best assurance of practicability is that the thing in question has been successfully done. Many cities can testify to the feasibility of physical measurements. Lincoln and Omaha afford special testimony as to the use of a shorter form which renders them practicable twice a year. With the proper organization of observers it is a very simple thing to take the measurements in the accompanying tables rapidly and accurately. Through the use of one set of instruments pupils can be examined

at the rate of sixty to seventy-five per hour, and this rate can be maintained for a whole day if necessary. The better plan, however, is to multiply the number of sets of instruments and observers and increase by that multiple the output of examinations. It is better not to interfere with individual school programs more than is necessary. From two to four hours are sufficient for the examination of any school, however large, with proper organization and supervision. The matter of obtaining observers is self-regulating; the larger the school the greater the number of teachers who are available for assistants to the corps of expert examiners in charge. It is advisable for any school to use at least two sets of instruments, one for boys and one for girls, in separate rooms. In Lincoln over three hundred children were measured through the use of two sets of instruments, working in separate rooms, within two hours. Ten afternoons of from two to three hours each were necessary for the measurement of two thousand five hundred children in ten different Lincoln schools, with the same equipment. With one set of instruments and corps of observers, ten thousand were examined in Omaha within four weeks. In both cases the work was accomplished through voluntary assistance, without compensation. Superintendents, principals, teachers, university professors, university students, local physical directors and practicing physicians constituted the observers. The argument of experience is final and conclusive. Any city school can spare a half day twice a year in order to ascertain the physical condition of its pupils. The matter of compensation will solve itself. The number of paid assistants can be made to keep pace with the growth of the necessity for them.

II. The General Physical Examination for Statistical Purposes

Has usually been introduced into public schools first. It has continued to be the most common because the most feasible with large numbers of children. Where physical examinations in public schools have been continued for any period of years they have most frequently followed the original scheme introduced from the statistical or anthropological point of view. The basal facts indicated by the measurements have rarely been stated to the pupil; the measurements have in most cases not been given to the pupil or to the parents, they have afforded little if any individual stimulus to the pupil toward the attainment of health and strength.

These measurements have occasionally modified the form of exercises given, but the result of such modifications has rarely been stated for the instruction of teachers of gymnastics in those schools. Some reliable conclusions exist as to the effect of systematic exercise upon growth in height and weight.

There should be a short general physical examination for all pupils in public schools. It should be taken semi-annually for the simple purpose of ascertaining the effects of various forms of exercise upon growth, but the vital purpose of this examination should be to sift out rapidly at the beginning of the year such cases as demand special examination from the physical director. Through it he finds cases which require special corrective work, and he also ascertains the general physical condition of candidates for athletic teams. Normal pulse and pulse after exercise should be included in general physical examination for all pupils. Postural deformities, congenital and acquired, should be carefully noted, those items, in brief, which can be readily secured through inspection. It is best to take the pulse with the ear to the chest, for then cases which demand special examination of the heart may be

III. The Special Physical Examination for the Individual

Usually consists of measurements, strength tests, sensory tests, and physical diagnosis. It should be given to those pupils who are discovered by the first general examination as requiring special attention. In some cities such examination is given to certain classes and even to all high school students. As soon as practicable it should be given to all children. This examination should be taken with clothing removed, or, if it is not practicable, let enough be removed to insure a satisfactory diagnosis. Let shoes be taken off and the clothing be stripped from the upper part of the body. All measurements in this system can be taken satisfactorily in this way and a thorough diagnosis of heart and lungs can be made, but for reasons obvious to experienced directors the entire removal of clothing is essential to the most thorough understanding of individual cases. This special examination affords a second sifting process by which children requiring the aid of a family physician or orthopedic surgeon are directed to the proper medical treatment, the director dealing simply with those cases which will yield to treatment by exercise.

Should the necessity of such an examination need defense, you are referred to any college director of your acquaintance. It is one of the commonest, as well as saddest, phases of the college director's experience to find students who, by carelessness or ignorance during the growing, formative period, have contracted diseases and deformities which are practically incurable. Two cases occur to me out of my own experience, both of freshmen. One had a severe case of hernia, the other was a confirmed epileptic. In both cases the parents were ignorant of the trouble, and, curiously enough, the fathers were both physicians. Possibly the development of the case of epilepsy could not have been stayed through prescription of exercise or of drugs during childhood and youth, but almost countless other dangerous maladies may be prevented through careful attention during this period, and the organism preserved and stimulated to healthy, vigorous development.

IV. Methods of Organization.

In dealing with this subject it appears best to assume that there is a director of physical training for the city concerned; that physical examinations are being introduced; that teachers in public schools shall be expected to act as observers and recorders; that the one described is the first examination; and that there already exists, or has just been organized, a strong branch of the A. A. A. P. E., through which the aid of leading physicians and others interested in physical training can be secured. (Vid. "Anthropometric Studies in Nebraska," page 10.) The problem presented by the city has been taken because it is the largest and most representative.

Methods for other fields of examination can easily be adapted to the local conditions. For example, with reference to observers, teachers in private schools have as much need of understanding the physique of the children as any teachers, and can more easily spare two or three hours from the program twice a year for physical training than for a number of faculty meetings to discuss policy with reference to dull or refractory students.

The whole force in a Young Men's Christian Association, including even the janitor, can learn in the concrete more about what underlies the boy problem by coöperating in such a form of practical examination than in double the number of conferences as to the theory of the thing. It puts the whole association force into closer touch with the physical department.

Recurring to the original point of view of the examination of children in city schools, the first thing to consider is—

Examination Blanks.

The use of four blanks has proven very satisfactory in several cities. The blanks used in Nebraska were suggested largely by those used by Dr. Porter in St. Louis. They differ from his, however, considerably in method and contents. A revised form of those used in Nebraska is introduced herewith, and is recommended where the accompanying tables are in use. Form A, Females; Form B, Males; Form C, Parents; Form D, Observers. Forms A and B are the same except in the wording of the heading as above. These two forms should be of different colors. Blue and other dark colors have been found less satisfactory than the lighter colors—straw, light brick red, or plain white. For the sake of ease in handling, and for durability (prevention of dog-earing when sent home to parents or when used for statistical work), use manila cardboard, or better, tag-board. It is much more satisfactory, also, for recording. When printed in lots of thirty thousand or more the first three forms cost from $1.50 to $2.00 per thousand; by the ten thousand they cost from $2.00 to $3.00 per thousand. Single thousands cost more than double these prices. Form D costs about $5.00 per hundred. It is printed on both sides. Where it is practical, therefore, for the state or local Physical Education Society to do so, much expense and trouble is saved by their official issue of the blanks in quantity, with a heading such as is here indicated. The size of composition in the regular forms is 8¼ inches by 3¾ inches. The full size of the card is 9½ inches by 4¼ inches.*

* If desired these blanks can be supplied from this office in small lots at 40 cents per hundred for the first three blanks, or at $3.00 per thousand. Form D at 75 cents per dozen, without cuts of apparatus. Folders of *Form D* with cuts of apparatus, 15 cents each; $1.50 per dozen.

Forms A and B may be had with short outline of "Diagnosis" on the back of each. This places "Personal History," "Measurements," and "Physical Diagnosis" all on one card for filing. These blanks can be furnished at 80 cents per hundred or at $6.00 per thousand. If desired these blanks as a whole can be furnished in the same general style (small) of card as that described for men in Chapter V. Suitable files can be secured from leading manufacturers at a reasonable rate.

DISTRICT SOCIETY

OF

The American Association for the Advancement of Physical Education

For the State of.....

FORM B—MALES.

1. Observer.....
2. School.....
3. Full name of pupil.....
4. Residence of pupil, No....., Street.....
5. Place of birth—State and Country.....
   .....
6. Date of birth; year....., month....., day.....
7. In what country was pupil's father born?.....
8. In what country was pupil's mother born?.....
9. Occupation of father.....; and mother.....
10. Number of pupil's sisters not living.....
    Cause and age of death.....
11. Number of pupil's brothers not living.....
    Cause and age of death.....
12. Diseases of near relatives.....
    .....
13. Diseases which the child has had.....
14. Diseases to which the child is subject.....
15. Forms of exercise in which engaged.....
    Prevailing forms of exercise .....
16. Hair—Black, Dark Brown, Light Brown, Red, Flaxen,
17. Eyes—Dark Brown, Light Brown, Blue, Grey,
18. Date.

19.	Weight.....				
20.	Height Standing.....				
21.	Height Sitting.....				
22.	Span of Arms.....				
23.	Breadth of Head.....				
24.	Breadth of Chest.....				
25.	Breadth of Waist.....				
26.	Depth of Chest.....				
27.	Girth of Head.....				
28.	Girth of Chest, Contracted...				
29.	Girth of Chest, Expanded....				
30.	Lung Capacity.....				
31.	Strength of squeeze, right....				
32.	Strength of squeeze, left.....				
33.	Grade.....				
	Class standing, per cent....				

Note:—Record figures plainly, with ink if possible. Place the figures close to the quality measured. Span of Arms, Breadth of Head and Girth of Head may be omitted when it is desired that only measurements which have hygienic value be taken.

PHYSICAL DIAGNOSIS.

(Where physical diagnosis is found practicable this blank is intended to be a convenient reminder of points to be observed. It covers those things most commonly observed by directors. It is divided into sections in order that parts not emphasized by any man may be omitted. It is well to err, if at all, on the side of thoroughness.)

I. Vision: R..... L.....

II. Hearing: R..... L.....
.....

III. Skin.....
.....

IV. Posture—Shoulders.....
Spine.....
Lower Extremities.....
.....

V. Muscles.....
Symmetry.....
Strength.....
.....

VI. Circulation—Heart.....
Rate normal.....
Rate after exercise.....
(20 full squats or equivalent)
Blood vessels.....
.....

VII. Respiration.....
Nose.....
Throat.....
Lungs.....
.....

VIII. Digestion.....
Teeth..... Stomach.....
Liver..... Appetite.....
.....

IX. Nervous Function.....
*Nerve Signs.....
Disease.....
.....

X. Injuries and Deformities.....
.....

XI. Remarks:

Add for net measurements:

XII. Excretion.....
.....

XIII. Generative Organs:
Condition.....
.....
Disease.....
.....

XIV. Hernia: Form.....
Character.....
.....

*By "Nerve Signs" are meant such as are observed by Dr. Francis Warner.

DISTRICT SOCIETY

OF

The American Association for the Advancement of Physical Education

For the State of.....

FORM C—PARENTS.

3. Full name of pupil.....
4. Residence of pupil, No....., Street.....
5. Place of birth—State and Country.....
   .....
6. Date of birth; year....., month....., day.....
7. In what country was pupil's father born?.....
8. In what country was pupil's mother born?.....
9. Occupation of father.....; and mother.....
10. Number of pupil's sisters not living.....
    Cause and age of death.....
11. Number of pupil's brothers not living.....
    Cause and age of death.....
12. Underline all the following that have occurred among near relatives:—Consumption, heart disease, scrofula, dyspepsia, catarrh.
13. Underline all the following which the child has had:—Pneumonia, typhoid fever, inflammation of bowels, diphtheria, rheumatism, hemorrhage, neuralgia.
14. Underline all the following to which the child is subject:—Throat troubles, lung troubles, heart troubles, biliousness, constipation, indigestion, headache, sleeplessness, nervous trouble.
15. Underline those forms of exercise in which the child has been engaged:—Indoor gymnastics, outdoor physical labor, indoor work in stores or factories, chores about the house, outdoor sports and games including running, jumping, hunting, bicycling, horseback riding, playing ball, etc. Please underline twice those forms of exercise of which the child has had most.

NOTICE.

Your coöperation is desired in obtaining size and strength and rate of growth of children of the.....of..... *Please fill out and return this blank with the child the day following that which it is sent out.* We wish to *assure parents* of the *following*:—

(1) Physical examinations involve no exposure of the person.

(2) No names of children will be published in connection with individual measurements.

(3) No personal defects of deformities will be pointed out before other children measured, or by newspaper articles citing such cases.

(4) The *object* of this examination is to learn the physical condition of children in order that this may form the basis for their physical training.

(5) Tables will be given each child which will show what his normal development should be, and will indicate also the proper physical basis for advancement in school work.

DISTRICT SOCIETY

OF

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF PHYSICAL EDUCATION FOR THE STATE OF.....

FORM D—OBSERVERS.

Instructions to Teachers and Other Observers.

Four printed forms are provided :—

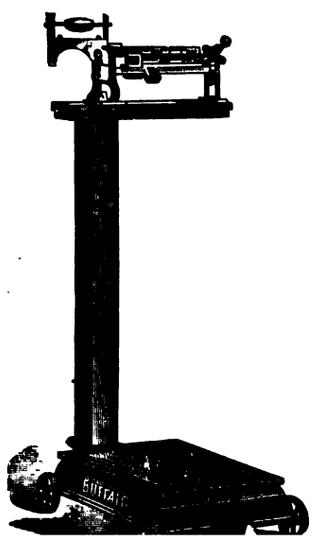
Form A—Female. (Tag Board. With or without "Diagnosis" on back.)
Form B—Male. (Tinted card. With or without "Diagnosis" on back.)
Form C—Parents. (Tag Board.)
Form D—Instructions to Observers. (Card, printed both sides.)

On the first day teachers will fill out, with the aid of pupils of their respective rooms, upon each pupil's card, the answers to 1, 2, 3, 4, 6, 16, 17, and 18. Let the child fill out, with pencil, any further items to which he may know the answer. Never examine any pupils until at least Nos. 3 and 6 are filled out in full.

Arrange children for forms A and B in the order in which they sit at their desks, and preserve this arrangement throughout the measurements.

In all measurements the place of the pupil measured should be instantly taken by another. Before the children leave their desks have them unlace their shoes, but tuck in the strings.

The observers stand in line, each ready with the instrument employed for his particular measurement, and a pen or pencil for recording the same, or, if possible, a recorder is provided for each observer.



Teachers marshal the pupils in line. Each individual's card is placed in his hand, and he proceeds to the first observer, and then down the line, carrying his card each time to the next observer.

Send home to parents Form C that day, and ask for its return the following day. The teacher of each room should record 33 that afternoon. The following day answers to 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15 are copied in ink upon Forms A and B.

Observations.

16, 17. Color of Hair and Eyes.

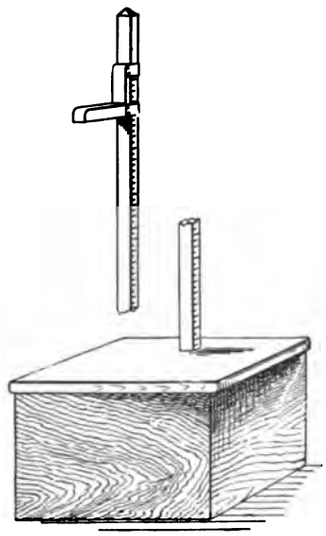
Choose the adjective that most nearly indicates the color—cross out the rest with pen and ink.

19. Weight.

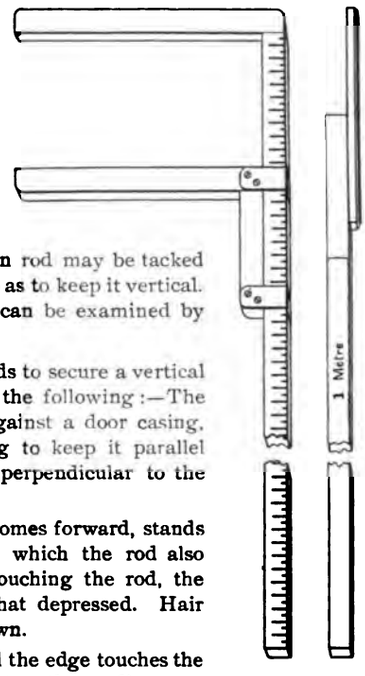
1. Use regular Anthropometric Scales, Buffalo or Fairbanks if available.

Height Standing and Height Sitting are taken with the Stadiometer or Seaver Measuring Rod.

20. Height Standing.



Stadiometer, or Height Stand.



"Seaver" Measuring Rod.

1. The first pupil takes off his shoes and leaves them in charge of a teacher or student assistant, who carries them to the end of the line for him.

2. Use a Stadiometer if one can be obtained. If not, the lower end of a Seaver combination rod may be tacked lightly to the wall or door casing so as to keep it vertical. All children over a meter in height can be examined by this use of the combination rod.

3. Another method which tends to secure a vertical position of the measuring rod is the following:—The teacher places the measuring rod against a door casing, the projections on the rod serving to keep it parallel with the casing, and presumably perpendicular to the floor.

4. The pupil in the first seat comes forward, stands firmly on the plane surface upon which the rod also rests, his heels, body and head touching the rod, the mouth closed and the chin somewhat depressed. Hair worn in a high knot must be let down.

5. Lower the sliding arm until the edge touches the crown of the pupil's head, and dictate the reading to a pupil assistant, who writes it opposite "20. Height, Standing." Meanwhile, the second pupil gets ready.

21. Height Sitting.

Use a Stadiometer. If one cannot be obtained, place an armless wooden chair with a *flat* seat sideways against the door casing. The measuring rod is held perpendicularly to the seat, the projections on the rod touching, if possible, the casing. Pupils come forward as before. *Take care:*—

1. That the lower part of the spinal column touches the rod.
2. That the mouth is closed and the chin somewhat depressed.
3. That hair worn in a knot on the back of the head does not introduce an error.

22. Span of Arms.

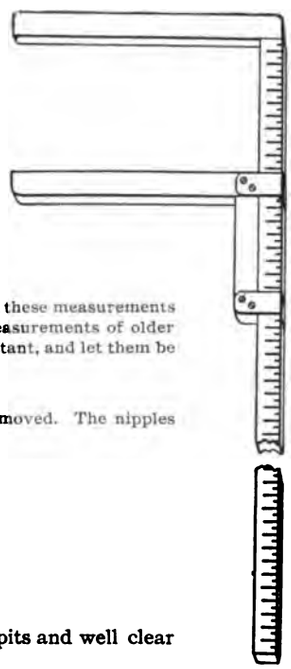
(Use Seaver Measuring Rod.)

1. Draw on the wall a chalk mark parallel with the floor and as high as the chin of a pupil of average height.
2. Hold the measuring rod parallel to the line and as high as the neck of a pupil to be measured.
3. The pupil touches one end with the middle finger of one hand and stretches along the rod as far as he can reach—chin up, heels together, body as close as possible to the rod, or,
4. Have the pupil stand with his back to the observer, extend the left arm and touch the wall with the end of the middle finger, then have him extend the other arm horizontally along the measuring rod and stretch, pushing the sliding cross-bar as far as possible. The observer must see that the arms are horizontal and that the

23. Breadth of Head.

(Use Breadth Calipers.)

Take the greatest breadth of the head between the ears, wherever it is found. Hold the calipers horizontally and symmetrically.



Breadth Calipers.

Breadth of Chest and Waist, Depth of Chest and Girth of Chest.

Note 1. For all these measurements it would be better to have the outer clothing removed, and to take them over one thickness of clothing, but in many places this has been found impracticable on account of objections from parents. Measure under the outer coats for boys, and for girls also where coats are worn. Coats need not always be taken off, but should be unbuttoned, and where vests are excessively thick, unbutton them also. For all these measurements especially, examine girls and boys separately, and secure lady observers for almost all the measurements of older girls. Dictate in centimeters and decimal fractions of a centimeter to a teacher or pupil assistant, and let them be written opposite 24, 25, 26, 28, and 29.

Note 2. All chest measurements are made on a level with the nipples.

Note 3. The axillæ provide a better "landmark" than nipples when clothing is not removed. The nipples are from an inch to two inches below the armpits, according to the size of the individual.

24 and 25. Breadth of Chest and Waist.

(Use Breadth Calipers.)

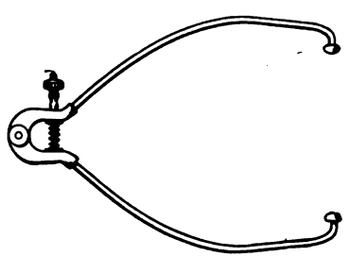
1. In taking breadth of chest, pass the prongs of the calipers under the armpits and well clear of them.

2. Use a firm but light pressure of the prongs, bringing them in contact with the projecting part of the ribs, and catch the measurement at the normal stage of respiration.

3. Breadth of Waist is taken at the narrowest part, with the chest normal.

26. Depth of Chest.

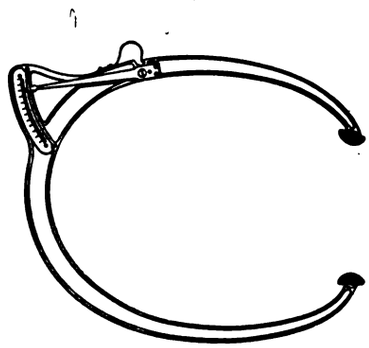
(Use Depth Calipers.)



Chest Depth Calipers.

1. Taken after a natural inspiration. Place one foot of the calipers on the sternum midway between the nipples, and the other foot on the spine at such a point that the line of measurement is at right angles with the axis of the spinal column.

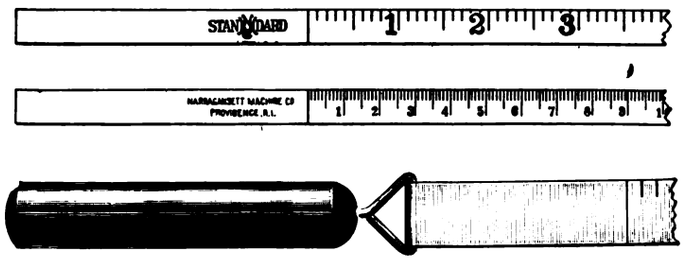
2. Use self registering calipers if available. If not, the distance between the tips of calipers may be measured on a tape tacked to the wall or table, or upon the breadth calipers.



Chest Depth Calipers. Self Reading.

27. Girth of Head.

(Use Anthropometric Tape.)



Anthropometric Tape 5 Ft. Metric and Inches.

28 AND 29. GIRTH OF CHEST CONTRACTED (CON.) AND EXPANDED (EXP.).

28. *Contracted.* Pupil breathes out, makes chest as small as possible, inclines head forward, draws shoulders slightly together.

29. *Expanded.* Shoulders back, head raised, deepest possible inspiration. Many children will require to be shown how to do this.

Wet Spirometer.

30. LUNG CAPACITY.

The pupil, after loosening the clothing about the chest and taking a full inspiration, filling the lungs completely, should blow steadily into the spirometer until all the air possible has been expelled from the lungs. Two or three trials may be allowed.

Spalding's Spirometer.

31 AND 32. STRENGTH OF SQUEEZE.

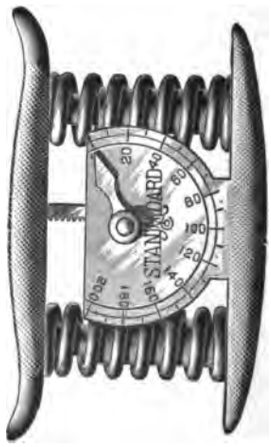
1. Depress the indicator of the dynamometer until the point of the indicator is exactly over the zero line of the scale.

2. Hold the dynamometer in the right hand so that the dial is turned inward, and squeeze the spring as hard as possible.

3. Read the outer scale (graduated from 0 to 100) to kilograms as exactly as possible. Write the number after "31. Strength of Squeeze, right hand."

If the dynamometer is graduated to pounds, the transposition to kilograms may be obtained approximately by dividing by 2.2.

4. Reset the instrument, and test left hand. (Do not touch the indicator. Always use the trigger, if the machine possesses one.)



Cuts of various pieces of apparatus are given in the order of the qualities examined, in the order of their position in the examining room. After the last piece of apparatus used in this examination there have been introduced a few pieces for the net measurements recommended in the last chapter. For the cuts of apparatus, I am indebted to the Narragansett Machine Co., who are prepared to furnish all forms of anthropometric apparatus. A. G. Spalding & Bros. have provided also a cut of their new spirometer, graduated to both

APPARATUS FOR THE SHORTER FORM OF MEASUREMENT FOR PUBLIC SCHOOL CHILDREN.

1.	*†	Anthropometric Scales, Fairbanks	$26 00
		Anthropometric Scales, Buffalo	32 00
2.		*Stadiometer	8 00
3.		Seaver Rod	4 00
4.		Breadth Calipers	3 00
5.	†	Chest Depth Calipers, nickeled metal	4 00
		Chest Depth Calipers, aluminum, self-registering	12 00
6.		Anthropometric Tape, with spring	75 cents
		Anthropometric Tape, without spring	25 cents 1 00
7.	†	Wet Spirometer, Narragansett Machine Co	12 00
		Wet Spirometer, Spalding & Bros	16 50
8.		Grip Dynamometer	10 00
		Net total for *briefest set of apparatus, without scales*	$34 00
		Total for full set of apparatus of best quality, $68.00 to $86.50, subject to school discount.	

ADDITIONAL APPARATUS FOR THE SHORTER FORM OF MEASUREMENT IN USE BY HIGH SCHOOLS, PREPARATORY SCHOOLS, NORMAL SCHOOLS, COLLEGES, AND YOUNG MEN'S CHRISTIAN ASSOCIATIONS.

1.		Push and Pull Attachment for the Grip Dynamometer	$10 00
2.	†	Back and Legs Dynamometer, Tieman	50 00
		Back and Legs Dynamometer, Upham	44 00
3.		*Anthropometric Cabinet	10 00
		Net total	$54 00
		Gross total, $64.00 to $70.00.	

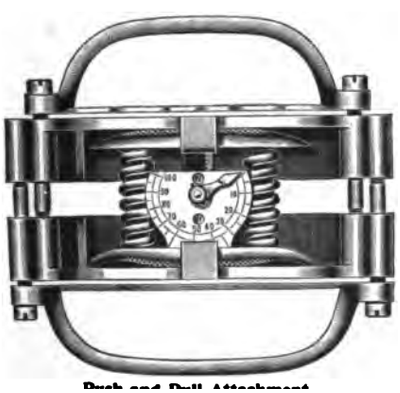
NOTE.—*1. Scales may often be borrowed or rented from merchants, where schools cannot afford to purchase. They are less convenient, because graduated to ounces, and usually somewhat less reliable.

2. The Seaver Rod may be substituted for the Stadiometer to save money, but this is not economical of time, and not advisable.

3. The Anthropometric Cabinet is recommended for convenience and economy. Care of instruments pays.

† Either instrument may be used. Both are reliable, but in each case the more expensive instrument is more convenient. The Fairbanks Scale has a double beam; the Buffalo a triple beam. The more expensive Chest Calipers are self-registering, and the measurement consumes, therefore, one-third the time required with the cheaper instrument. The Spirometer gotten up by Spalding & Bros. is graduated to both cubic inches and litres. It is a simpler machine in construction. The removal of the air is easier.

Liberal discounts are usually made to educational institutions, so that the above is not net cost of apparatus.



Push and Pull Attachment

SHOULDER RETRACTORS.

(Use Push and Pull Attachment.)

The machine rests lightly against the upper sternum, with the indicator to the front. The pull is made with the bent arms in about a horizontal plane. The pull is from the median line of the trunk, outward.

Directions for taking Strength of Back and Legs are taken from "Intercollegiate Strength Tests":—

Back, Legs and Chest Dynamometer. (Tieman.)

STRENGTH OF BACK.

(Use Back and Legs Dynamometer.)

Adjust the handle to the chain or dynamometer so that when standing erect the outstretched fingers placed in front of the thighs will come within about three inches of the handle. Incline the body forward at an angle of about sixty degrees, grasp the handle, take a full breath, and without bending the knees give one hard, steady lift, mostly with the back. In taking the lift the person must stand with the back to the wall, or back-board, but in no case will the body be allowed to sway back against it.

STRENGTH OF LEGS.

With the same apparatus arranged as for the back lift, standing upon the foot-rest or table with the body and head erect, chest thrown forward, and bending the knees until the handle, grasped with both hands, rests against the thighs, take a full breath, and give one hard, steady lift, mostly with the legs, using the hands to hold the handle in place. In making the leg lift, two pads, each twelve inches long, six inches wide, and one inch thick, may be used to protect the hands and thighs, but in no case may these pads be attached to the legs or to the garments. Lifts made by "snapping," "jerking," or "jumping" up the dynamometer will not be accepted.

Anthropometric Cabinet.

Some General Directions May Be of Use.

Take the measurements in the order given upon the blank. This makes it necessary to place the apparatus in the same order about the room. Have as many tables as recorders, if possible, and let the pupils pass down the line of observers between the tables and the wall. This plan is conducive to order and speed. When this method is used the pupil can hand his card to the first recorder and let him pass it down the line of recorders as the pupil is examined. For the most advantageous work there should be eight observers. One may combine the taking of the first quality, Weight, with the supervision of the whole, but it is better to be free. One observer is placed on Weight (No. 19), one on Height and Height Sitting (Nos. 20 and 21), one on Span of Arms (No. 22), one on Breadth of Head, Chest and Waist (Nos. 23, 24 and 25), one on Depth of Chest (No. 26), one on Girth of Head and Chest (Nos. 27, 28 and 29), one on Lung Capacity (No. 30), and one on Strength of Squeeze (Nos. 31 and 32). A reliable recorder is given to each observer.

Instructions should be given to teachers as a body at some stated time before the examination. When there is a physical director it belongs to him to supervise this preliminary training. They should be practiced in the individual measurements which each one is to take, and have a little preliminary practice, also, upon a few individuals, as a regular examining corps, with all members present. This should include, also, how to guide the pupil in taking the proper position. The pupils should receive instructions before leaving their own school room, as to the nature of the scheme and what is expected of them. It is better, also, to repeat

with the first group some general instructions as to progress along the line of observers, where to unlace their shoes, where to leave the completed examination blank, etc. Groups which follow will learn by seeing others under process of examination.

It is evident that, by such a coöperative method of examination, the whole work can only proceed as fast as the slowest observer. It may be necessary to make changes in the observers after the work is begun, but it is always safe to put the most adept examiners on the following measurements. The order of importance is usually the following: The Girths, Span of Arms, Breadths and, unless a self-registering pair of calipers is used, Depth of Chest.

As has been intimated the pupils should be moved, not the apparatus. A room of comfortable proportions should be set apart for the work for boys and a separate room for girls. Where examinations are taken in the afternoon, it works well to begin in the kindergarten and primary grade rooms and progress by grades upward, as the older pupils can usually be kept longer.

Give special instructions to recorders to place figures close to the qualities taken, to use ink if possible, and in any case to make clear, bold figures.

Give special instructions to teachers about the removal of over-jackets, and just how to take each measurement over the clothing, if it is one where clothing is to be reckoned with. Less than half of the measurements in the accompanying tables require any special attention to clothing on the part of the observer.

Examine in the fall and spring, when about the same weight of clothing is worn. October is a good month for the fall, the middle of September not too early in most states. Examine in the spring, six months later.

The weight of clothing is a comparatively constant quantity in children at the same time of year. According to Dr. Bowditch's experiments upon children from five to sixteen years of age, the average per cent of the gross weight to be allowed for the clothing of boys is 8 per cent, for girls is 6.8 per cent. The weight of the clothing increases very regularly about half a pound each year for boys and a little less for girls, but the percentage of gross weight remains practically the same.

Two methods have been followed as to giving warning of examination to pupils. One city warned schools beforehand, another did not, but pounced down upon the school without warning except to the Principal. The latter plan was most successful. Children were in neither case compelled to take examinations, but in the latter case parents did not have a chance to object beforehand to that which they did not understand, and the children were not made foolish by their objections. To some few children, measurements are at first a bugbear, but, after one examination, usually a pleasant anticipation. Even the younger children frequently ask very thoughtful questions about development.

Pupils often attempt to carry away or ask to keep the blanks upon which their measurements are recorded. Explain to them before the examination your policy about the matter, whether you will allow those that wish it the privilege of using blanks upon which to make duplicates, or whether they will be provided with anthropometric tables for this purpose. This may seem a very small thing to mention, but it has been known to consume a vast amount of time. It is evident that to get rid of interfering causes is the only way to secure speed and accuracy.

Instructions for Taking Measurements.

For directions and illustrations as to the taking of measurements with clothing removed, you are referred to Dr. Gulick's "Manual for Physical Measurements," to Dr. Seaver's "Anthropometry," and to Dr. Sargent's "Anthropometric Manual." For the most extensive statement of matter and method for psycho-physical measurements, to "The Experi-

mental Study of Children," by Arthur MacDonald. Dr. Porter's "Growth of St. Louis Children" is very suggestive as to methods of examination as well as calculations of results.

The writer has no desire to trench upon ground already covered, and will confine his statements to a few further cautions as to gross measurements.

With proper care clothing is not a serious barrier to obtaining satisfactory standards of development. Less than half of the measurements in the accompanying tables are affected by clothing, and in only four is any especial care necessary upon the part of the observer. Height and Height Sitting are increased almost inappreciably, an average of about one millimetre. As has already been stated, with reference to the remaining measurements affected by clothing, Weight, Breadth of Chest and Waist, and Depth of Chest, the most important direction is that the measurements be taken in the fall or spring, and not in the winter. There are two distinct reasons for this direction. Thickness of clothing varies more in the winter; greater thickness prevents accuracy of examination and renders the accompanying anthropometric tables less accurate as standards of development.

In taking weight, care should be exercised in relieving any intentional or undue loading of pockets, and all overcoats and over-jackets must be removed. The removal of shoes has already been indicated. Hats are of course removed. Breadth of Chest and Waist, and Depth of Chest must be taken with the chest normal. The observer must see that the arms hang naturally at the sides. Pupils tend to lift the arms from the sides in all chest breadths and girths (this increases the breadth from one to three centimetres) and to swell out the chest, deepening it abnormally during the taking of the Depth of Chest. As has already been indicated, in case of obvious excess of thickness of clothing, unbutton at the front and include but two thicknesses, and where both are unduly heavy include but one. In a few such cases it has been necessary to unbutton the vests of boys, where they were very heavy. Attention is called again to the caution in Form D for Observers, with reference to errors which may be introduced by the manner in which the hair is worn. Where coils and combs, etc., interfere, they must be taken down, as otherwise Height, Height Sitting, Breadth of Head and Girth of Head are materially affected. The chest measurements are taken on a level with the nipples, not because it is thought they are as valuable as those taken at the ninth rib, but because, without the removal of clothing, it is practically impossible to take them accurately at the ninth rib. The axillæ form a good "landmark" in taking "on a level with the nipples." The instruction for obtaining Breadth of Chest may be, "take breadth under the armpits." The general caution which includes almost everything is, be careful of *position*.

CHAPTER III.

THE BASIS FOR THE ADAPTATION OF VARIOUS FORMS OF EXERCISE TO PUBLIC SCHOOL CHILDREN.

For adults the problem of adaptation of exercise is virtually settled. Along certain general lines we are all agreed as to policy of treatment. For the average college student a small amount of general corrective gymnastics and a large amount of hygienic and educational work are prescribed; for the student having disease, atrophy or postural deformity, a large amount of general and special corrective gymnastics and a smaller amount of educational gymnastics are given; for the sound and vigorous, in addition to some educational gymnastics and hygienic body-building work, participation in competitive games and sports, well supervised, receives general approval. It is not this general adaptation to *classes*, but the adaptation of the exercise to the *individual* which still demands special attention in the college field.

It is this same adaptation of exercise to the individual which demands our attention most strongly in the public school field. Perhaps the same observations as to general prescription of exercise will obtain in a measure for the different classes of school children as for college students, but not without qualification. Growth introduces a disturbing element, which, while it provides the greatest encouragement and stimulus to our interest and effort, yet requires a new form of adaptation. Exercise must be suited not simply to the physique of the pupil, but to his stage of development. It must be adapted to the nascent periods. The lines of demarcation between these different periods may not yet be clearly defined, but we are convinced that they exist and that they present conditions to be met. The basis for the adaptation of general gymnastic drills and days' orders to the nascent periods must be found in the psychological and physiological effects of exercise. The basis for the further and closer adaptation of special exercises to the individual must be found in the individual physical examination.

It is not the purpose of this chapter to raise any question as to the comparative merits of systems of gymnastics and their adaptation to the needs of school children. These systems have grown up out of differences in emphasis, in point of view. It is not a fact that any of us disbelieve in corrective, or educational, or hygienic, or recreative work, but in the stress which should be laid upon some one of these forms of exercise, and it is this stress which has given rise to respective systems and has characterized those systems. My subject has nothing to do with our differences, but only with matters about which we may hope to agree; nothing to do with the value of systems, but with the value of individual exercises which form a part of systems; nothing to do with advocating the adoption of any scheme of exercise, but with the adaptation of exercise to the needs of school children individually; and the primary object of the next few pages is not the discussion of the adaptation itself, but of the basis for it. If I could tell you exactly what kind of exercise to give each child I should have solved one of the most vital questions of the times. It is my hope simply to contribute something in the way of method toward making this most coveted solution possible.

It is asserted by some that we are like the doctors of a half century ago, who bled and physicked all alike for every ailment; while we directors give the same drills indiscriminately to all classes, to the injury of many children. It may be that in some places only general drills are given in public schools. It may be that the exercises which make up these drills are not as well adapted as they should be to the age and to the physical condition of the pupil. It is not true that they are causing serious injury to many pupils; it is not true that general

drills are valueless. But the criticism may be profitable if it incites to the preparation of days' orders which are better adapted to the needs of children as a whole. A general course of medical treatment for the digestion not infrequently accompanies special treatment for specific disease, or the physician may give nothing more than simply tonic treatment to a case. So, also, general forms of exercise may be given as a tonic for the whole system. They have the advantage of being a natural tonic, like good air or pure water, and the nearer they approximate the natural forms of physical activity which belong to the nascent period in question, the better their physiological effect, the keener will be the physical appetite for them, the stronger the individual interest and attention. By natural forms of physical activity are meant those which repeat the physical history of the race. These are not merely the best forms of hygienic exercise; they are also the most effective for the development of intelligence and character.

There is need of more individualizing in this as well as in other pedagogical lines, but the first and most practicable step in this individualizing is to provide as many kinds of exercise as there are general types of pupils; is to have a graded section of corrective work, a graded section of educational gymnastics, and a graded section of hygienic and recreative work for the various ages. In the development of these graded series of exercises let the order of progression coincide with the order of development of the physical activities of the race—as far as this order is understood. Let individualism enter in so far as to regulate the general trend of the exercise of each student. John Brown has pronounced spinal curvature, narrow, flat chest, and general nervous debility. The gymnastic teacher places the emphasis upon the corrective section of exercises with John Brown and guards him against over-exertion in any games. His brother is vigorous, replete with vitality, broad and deep-chested, straight as an arrow. The corrective section may not be required for him at all, while the recreative will be emphasized to the full, as his vigorous tastes naturally lead him. The director may thus only give such time to the individual as to regulate the emphasis of his physical work. In some public schools it may not yet be practicable to enter more intimately into individual adaptation of exercise. It may not be possible to give special corrective work for individual deformities and diseases, but the time is not far distant when the assistance will be forthcoming for the handling of all these lines of work as carefully and methodically as they are cared for in our best colleges and universities.

Our business as physical educators is the cure and prevention of postural deformities and of disease, the promotion of normal growth, and the conservation of health and normal functional activity. The business of the physician is the same. By the majority of physicians, however, the emphasis is laid upon the curative rather than upon the preventive side. Under existing conditions the physician's work is directed largely toward the cure of specific disorders, that of the director toward the prevention of them. Through Boards of Health physicians seek to prevent exposure to infectious diseases, directors seek to put the human organism in a better condition to resist all forms of disease. The physician gives drugs to restore functional activity, the director develops functional activity by use. The physician gives drugs only after a thorough understanding of the physical condition of the individual, the director must give exercise upon the same rational basis. The diagnosis of the physician is more specific than that of the director. The treatment of the physician is more specific, that of the director more general. The director's work is supplemental to that of the physician, and not in any sense a substitute for it, except so far as by the prevention of disease he renders the work of the physician unnecessary.

What, then, aside from the information to be derived from psychology of exercise, is the "basis for the adaptation of various forms of exercise to public school children"? An exact knowledge of the physiological effects of the exercises given, and of the

exercise to give to meet each condition, is the periodic examination of large groups of children of the same age, sex, and general social conditions, who have meantime been subjected regularly to different fixed types of exercise, and the comparison of their growth and development at the close of each period. Only by such painstaking method can the exact knowledge which is requisite be obtained. The means for learning the second, "the physical condition of the individual," is the physical examination of each child. For the first is required the general physical examination for statistical purposes, for the second, the special physical examination for the individual.

I. THE GENERAL PHYSICAL EXAMINATION.

The general physical examination for statistical purposes has included, according to location, measurements, strength tests, psycho-physical tests and, in some rare instances, medical diagnosis. The weight of emphasis in character of tests has varied with the point of view of observers. Most of these tests doubtless need to be made, all of them have a scientific value, but the question is one of fundamentals. A well arranged system of physical examinations and physical exercise must be provided for public schools. Other forms of investigation need not cease, but let the elementary, the first things, come first.

Let me submit a few propositions as to these first things to be ascertained through the "general physical examination."

1. The general status of *growth and vitality* is the first thing for a teacher to know about a child.

2. The *simplest* things which will afford some real measure of this growth and vitality should be employed first, because simplest things are most practicable, teachers can understand them, can coöperate in the observation of them, and apply the knowledge gained.

3. The *fewest* things which will afford a real measure of growth and vitality should be employed, because extended examinations are often impracticable, directors have too little assistance, and teachers too little time.

Technical physical measurements, strength tests and psycho-physical tests, though very often most valuable, should be secondary in point of time of introduction into public school examinations. Expert observers must be provided before the more technical examinations become practicable. It is evidently not logical or economical to introduce them first in order.

Each form of investigation should be thoroughly organized and certain persons should be made responsible for its execution before another is inaugurated. Teachers become confused and discouraged with a mass of detail work for which they find no application. It appears to me that we are in the beginnings of a great movement toward the organization of a consistent scheme of physical training for public schools; that the large number of isolated facts as to measurements and physical exercise, and methods of organization for the handling of both in public schools, demand correlation and exact statement; and that through coöperation in the use of periodic physical examinations of a simple but vital character, we must hope to arrive at some exact conclusions as to the hygienic effects of various forms of exercise. If this be true the greatest need is for physical education societies to agree upon *first things*, to agree upon methods by which these things are to be accomplished, to lay aside other shades of opinion and to coöperate heartily until the first thing is done; then to take up the second thing, and the third thing, and so on, until our pressing problems are settled. At the end of another decade of solid search for exact knowledge, doubtless opinions will have grown very much nearer alike.

If state of growth and vitality of the pupils is the first and most vital thing for the teacher to know, the measurements taken should be those which show the vitality of the individual, and the most important changes which can be recorded for a pupil who is being subjected to

a certain course of exercises are in those physical qualities which indicate vitality. We do not care so much whether a child's girth of elbow, knee or instep, length of arm or leg, is greater, as whether he has greater endurance, is better able to stand the strain of school work, better fitted for living.

Little has been done along this line. The most valuable, in fact, the only general, as well as exact, conclusions as to normal growth which have been thoroughly worked out are with reference to height and weight. The work of Frederic Burk in the correlation of existing facts as to the height and weight is an admirable example of the satisfaction of one of our needs. What has been done in height and weight should be done for the principal qualities which indicate vitality. This excellent work of Burk impresses one with our limited knowledge of the laws of growth.

An additional step must be taken in the same direction. For these same qualities which indicate vitality not only should normal growth be ascertained, but the development which can be obtained through various forms of systematic exercise over and above that which takes place without such exercise. It is not enough to assume that certain things are so; it is not enough to say, "I have observed"; it is not enough to be able to state how much better developed the children of this city are than those of that city. Various physical factors, such as national extraction, occupation of parents, climatic and other hygienic conditions, may enter into the problem to produce the difference in general development. The only fair solution is to take children of the same age, sex, and social conditions in the same city, and to make actual experiments during various parts of the same year and a period of years. Such investigation should be carried on in several cities during the same period. There is no short cut to this thing. It is worth while. It can be done only through coöperation. Shall we not give it?

My contribution to this movement is in the nature of method of organization, in pointing the way for the use of measurements which indicate vitality, and in the publishing of a suggestive series of blanks. A beginning has been made in what appears to be the right direction. The form of examination proposed is valuable, first, for the promotion of interest in physical training in a city; second, for the investigation of the adaptation of various forms of exercise; third, for the stimulation of greater effort toward the attainment of physical development on the part of the children themselves, through anthropometric tables given them to show their individual status and growth; and, lastly, for the sifting out of cases which demand special and more thorough examination.

A few introductory words as to the place of measurements and their relation to exercise may be of value, in order that we may begin with the same point of view.

The Place of Measurements.

1. They are not a substitute for a medical examination, are not intended to take the place of such an examination, but they are basal to the most thorough medical examination. Their use in the United States Army, and in the armies of the other great world powers, for the sifting out of desirable recruits is sufficient evidence of their general value. The military measurements are the most exhaustive list in use; college measurements stand next.

2. A physical examination, as taken by the average physical director in preparatory schools, colleges, and the Young Men's Christian Association, consists of physical measurements, strength tests, and physical diagnosis. The last named does not usually include a complete medical diagnosis, but may include sensory tests (especially for eyesight and hearing) and a general physical diagnosis sufficiently thorough to enable the director to sift out cases which require special medical attention. The director observes all postural deformities

degree of asymmetry in muscular size and function, gains a general idea of the vitality of the individual and of his weak points through the use of anthropometric tables, and proceeds to the practice of gymnastic therapeutics for their correction. Few cases require the use of drugs upon the part of a physician. Perhaps a slightly larger number require special corrective exercises. The majority require simply all-round exercise of an interesting character, which will promote healthy normal function.

3. The physician is usually called in to examine and prescribe for acute and chronic diseases. The physical director examines all alike, healthy and diseased, sends the physician his quota, gives any special exercises prescribed by physicians for special cases, but allots the greater part of his time to the promotion of normal function, of health, of normal growth and development in the rank and file of his gymnasium members. Measurements are taken from the point of view of preventive medicine rather than from that of curative medicine. They contemplate some orthopedic work, but more hygienic work.

II. THE RELATION OF MEASUREMENTS TO EXERCISE.

At the beginning of the past decade physical measurements were unduly emphasized, at its close they were unduly discredited in many quarters. In educational institutions there has been no decline in use, but a steady increase. In the Young Men's Christian Association there has been some decrease in their use. The change, however, has not been so much in the decrease in individuals examined, but rather in the decline of emphasis upon the value of measurements. The explanation of this is not difficult to find. The reaction against the old form of physical examinations has grown out of a change in the whole point of view of physical training. This reaction has been stronger in Association gymnasia because the purpose and character of their exercise has changed most. The general trend of this change in the character of exercise has been from developmental* to hygienic work, from the pursuit of muscular symmetry to the pursuit of health and vitality.

For at least a quarter of a century measurements taken from the developmental point of view flourished. Exercise was given from the same point of view. The measurements were taken as a guide to the exercise. The scheme was to find out the size of various parts of the body and compare it with certain fixed standards of excellence, then go pull at a machine or push a dumb bell so many times for so many times a day, an increasing number of times for the days, weeks or months which were required to bring the desired increase of girth. The old idea was for the director to measure bone lengths, bone girths, muscles girths, breadths, depths, strengths, in short everything which could be measured. The man was not treated as a unit, but a thing made up of head, neck, arm, elbow, forearm, wrist, foot, calf, knee, etc. One stimulating writer of this period states that the neck, calf and biceps in the symmetrical man should have the same girth. He will perhaps never know how many weary hours with dumb bells or at the pulley weights he has given thousands of men in their attempt to bring up the refractory biceps to his standard, nor realize to the full the vicious effects of the restriction of the thoracic capacity induced by the consequent over-development of the pectorals. It was assumed that symmetry of bone lengths and muscle girths was equivalent to physical perfection, the guarantee of normal function; that the outside indicates what is inside; that asymmetry is a species of disease. Fifty or more measurements were taken, and then nearly as many machines devised to provide the development for each isolated group of

*The term "developmental," as used here, is meant to be applied to the scheme of exercise formerly much in vogue, which based prescription of exercise largely on muscle girths. The typical exercises given were pulley-weight movements. The size of a part was ascertained, and exercise was applied which, to the degree possible, promoted added function to that isolated muscle or group of muscles. The importance of the development of co-ordinated movements was almost entirely neglected, and so neural and truly educational effects were very limited. The amount of muscle tissue involved was generally very small, and

muscles involved; to correct the size of muscles was to correct everything; developmental work was the great panacea for all human ills.

The developmental idea has been exploded. As confidence in this idea has declined among leading physical directors, and in the leading schools of physical training, it has been taken up by almost innumerable correspondence schools, and we are privileged now to see them masquerading in our cast-off clothing. Not all these correspondence schools press this point of view, but those who do it gain influence with a public which has been most thoroughly educated in this view for a quarter of a century.

The long lists of measurements which were originated primarily as the basis for developmental work, must perish with this work. The whole scheme dies together. The idea had a plausible sound, but it failed to bear the test of experience.

1. Mature individuals rarely attained the desired girths.

2. Those who attained the desired muscular standards rarely appeared to increase correspondingly in endurance, in vitality. Many were observed to be inferior in vitality to individuals who were untrained in any systematic forms of exercise, but who had simply a taste for general outdoor forms of activity. Others even made a distinct loss in endurance. A notable example of such loss is that of one of the promoters of a "Home Exerciser," who for many years exhibited as an example of what his machine would do. He acquired immense knotted masses of muscles, great strength in individual groups of muscles, but the movement of thoracic and abdominal walls became very limited; his vital capacity became unequal to the support of the muscular system. A few years ago he went to California for lung trouble.

3. The development attained through the use of exercises for isolated groups of muscles, either by pulley weight movements or by other formal gymnastics, was more easily lost after discontinuance of systematic work in the gymnasium for the reason that the exercises were of an artificial character; they were not natural, not racial, and therefore did not so readily give rise to fixed habits of activity. One of the chief functions of systematic exercise was practically lost, the attainment of a keen appetite for physical activity, and a permanent habit of gratifying this appetite in various natural and accessible forms.

4. The muscular and neural co-ordination attained through developmental work was not of a character which fitted the individual for the ordinary pursuits of life. Such training tends to slow this co-ordination as well as to limit the ability to apply the muscular strength to daily duties. Ordinary movements are complex; they bring into play various groups of muscles; in natural movements the work of the muscles is coöperative, they are interdependent. Manifestly the exercising of muscles in isolated groups does not best fit them for their daily functional activity.

5. Lastly, developmental work lacks interest; provides little diversion of the attention, involves largely a change of attention; lacks the recreative element, and hence affords little brain rest.

The basis for developmental forms of exercise has rightly been developmental measurements. The point of view is rapidly changing. Hygienic forms of exercise are superseding the old forms. Hygienic measurements must then supersede the old forms of measurement; we must take those measurements which have to do with ascertaining the vitality of the individual.

Those who do an all-round work must still employ developmental exercises in some cases for the correction of asymmetry of muscular function; they must do some special corrective work for postural deformities; they must use heavy apparatus work and other educational gymnastics for a few men; must give athletic training to selected vigorous men; but the

III. THE VALUE OF INDIVIDUAL MEASUREMENTS.

The use of a longer list of measurements, such as are to be found in the average college anthropometric table, does not tend to raise this question of relative value of measurements. It would seem even that the use of forty or fifty tests tends to obscure the chief purpose of the physical examination, which is evidently to ascertain the vitality of the individual. It would no doubt be well to take a hundred tests during each examination, but the matter of time and economy of energy comes into the problem. The vital question of dealing with large numbers of examinations is that of practicability. The superintendent, principal, teacher, or physical director ought not to minimize the value of any of the measurements and other tests now being taken, but he is compelled to emphasize rather the matter of adaptation to the ordinary conditions of school and Young Men's Christian Association life.

As has been intimated, the point of view determines the character of the measurements taken. They may be sought for their anthropological value, for the determining of the laws of growth and development, as a basis for rational corrective work, as a basis for athletic selection, to demonstrate the physical basis of mental efficiency or some other psychological fact, for the testing of functional activity and strength, for the determining of vitality, and perhaps for other reasons. The general points of view for measurements have been anthropological, developmental, orthopedic, pedagogical, psychological, physiological, and hygienic. One measurement, it is true, might be taken from all these points of view, *e. g.*, height and weight. All measurements have anthropological value; they show racial characteristics as well as individual deviations from a calculated type. Difference in point of view is largely one of emphasis. To illustrate from an ordinary percentile table. Bone girths and lengths may be termed characteristic anthropological measurements because of little value from any other point of view; girth of wrist, of elbow, of knee, of instep, and length from shoulder to elbow, elbow to finger tips, height of sternum, etc., are good examples, they have little *practical* value. But chest expansion and sitting height have a distinct and important hygienic value. The characteristically developmental measurements are muscle girths; orthopedic are those indicating asymmetry; pedagogical and psychological are head measurements, tests of sensory function, of motor ability, etc., as well as those indicating the physical basis of mental ability; physiological and hygienic are closely related, embracing all measurements of sensory function, muscular function and vital function. Tests of eye-sight and hearing are the most important of sensory tests. Strength tests provide the best means of testing muscular function. By best is meant the most representative and most practicable. Trunk dimensions, chest expansion and lung capacity are most representative of vitality.

The primary point of view for the taking of measurements is *hygienic*, the primary end sought is *vitality*. Other tests, as soon as found practicable, should follow in the logical order of importance, but the first and fundamental list of measurements must proceed from this point of view and have this end.* It is not supposed that a list of measurements can be selected which fulfills but the one purpose, the determining of vitality, nor is such a list desirable. It is characteristic of measurements selected for this end that they are fundamental. They may form the basis of a variety of valuable deductions. In the selection of a short list of tests of vitality, therefore, where tests seem equal in value for this end, that measurement should be selected which answers the greatest variety of practical ends in addition to the first. For example, among fundamental measurements "girth of chest expanded and contracted" may be used to indicate growth and development, physical basis of mental efficiency, racial characteristics, corrective gymnastics, athletic adaptation and muscular function, as well as vitality.

IV. MEASUREMENTS WHICH INDICATE VITALITY

Are necessarily of two distinct closses, those which indicate *bulk* and those which indicate degree of *function*. Of the first class weight is the best *general* indication of vitality. Of the lengths, only height sitting or trunk length have any special value. Fractional sections of these may be used if found practicable, such as notch of sternum to ensiform appendix, ensiform appendix to umbilicus, umbilicus to pubic arch. Of the breadths, breadth of chest and waist are valuable; of the depths, depth of chest and abdomen; of the girths, girth of chest expanded, contracted and normal, and girth of waist are significant. Breadths and depths of chest may be taken with advantage after full inspiration and full expiration. The half sum of the two extremes constitutes the normal. (See Chapter V.) Girth of chest at ninth rib can be taken only when clothing is removed. It is much more accurate than girth of chest at the level of the nipples. Girth of hips and girth of neck would be employed where there was also a sectioning of sitting height as indicated above. Of the second class strength of forearm, back, legs and shoulder retractors are the most valuable of those which indicate muscular function and neural control. Of the vital functions, the most practicable to measure, as well as the most important, is the respiratory. Tests for this function are simple, easy for the ordinary observer to learn to apply. For the correction of defects in respiratory function the list of effective exercises at the command of the director is rich and full, and in the process of improvement of respiratory efficiency the whole system undergoes a thorough tonic treatment. For all these reasons, then, this has been selected as the most representative vital function. Next in importance and facility of examination comes the circulatory function. Heart size and function, as well as blood pressure, may be taken readily, but for this work expert examiners are required. The taking of normal pulse rate and of pulse rate after exercise is exceedingly valuable as well as practicable.

V. MEASUREMENTS IN THE ACCOMPANYING TABLES.

Since the examination of large numbers of children demands, as the first consideration, practicability of doing the work, measurements must be rated according to their adaptation as well as their inherent value. Practicability depends upon fewness of measurements, non-removal of clothing, and simplicity of measurements, *i. e.*, upon the ease with which observers learn to take them accurately and upon method of organization for such examination. (See "Methods" in this chapter.) The considerations which have governed in the selection of the measurements and strength tests for the accompanying tables were:—First, Inherent Value, especially for the determination of vitality; second, Breadth of Application; third, Practicability.

Breadth of Head and Girth of Head were selected primarily for the demonstration of the physical basis of mental efficiency; Span of Arms from the point of view of growth and development, and for the indication of function in the upper extremities. The remaining eleven measurements were chosen primarily for the indication of vitality in accordance with the foregoing principles. Strength of Forearm, Right and Left, show muscular strength and function and neural control. This simple test of the muscles of the forearm is the most representative of those which are practicable for a general brief examination. Of the vital functions, the respiratory is the most important for the determining of vitality. Lung Capacity and Chest Expansion are the simplest and most important tests for the indication of respiratory efficiency. Chest Expansion is practically the same whether taken with or without clothing, but Chest Expanded and Chest Contracted are not used in the tables because the

equation of clothing could not be easily reckoned. Chest Expansion and Lung Capacity, also termed Vital Capacity, represent the same thing in different ways, viz., flexibility of the thorax and control of respiratory muscles. Both these tests then represent function rather than absolute lung size, and for the further reckoning of real "vital capacity" the dimensions of the trunk must be considered.

In the choice of measurements indicating bulk the choice fell first upon trunk dimensions, that is, if you will, upon the length, breadth and depth of the box enclosing the vital organs. Height Sitting, Breadth of Chest, Breadth of Waist and Depth of Chest were selected. Out of all trunk measurements these are least affected by clothing, can be taken with the greatest facility and are the most important. "Sitting Height may not at first sight appear to be an accurate dimension to be used in computing the cubic contents of the trunk, because in addition to actual trunk length it includes length of head and neck. It would appear more accurate to employ the actual trunk length, but it is entirely impracticable to obtain this measurement accurately without the removal of clothing and the aid of expert examiners. Since the length of head and neck is practically a constant quantity, greater accuracy than that secured by Sitting Height is not essential. For the *absolute* statement of a physical ratio it would be better to use the trunk length, but for the *comparative* statement of individual vitality for purposes of diagnosis, the use of Sitting Height produces an Organic Strength-Height Coefficient of sufficient accuracy." ("Propaganda," Physical Education Review, December, 1901.)

Height Sitting, Breadth of Chest, Breadth of Waist and Depth of Chest have long been adjudged among the very best indices of vitality. But they possess not so much an absolute as a relative value. The really vital thing to ascertain in the whole matter is the comparative size and function of the master tissues and the serving tissues. Is the development of the vital organs in proportion to that of the muscular system? If the balance is in favor of the vital organs the individual will possess great vitality. If the individual has a large muscular frame associated with a small vital capacity he will not possess any great endurance or "staying power." Hence, the usual low vitality of the over-tall children with long legs, and the very pronounced strength and endurance of long-bodied and round-bodied children. In the symmetrical man at maturity the sitting height is about half the total height; in boys the ratio varies with the age.

Height is the standard upon which all statement of comparative vitality must be based. All correct statement of development is relative to total bone length. Height as the most representative measurement has been introduced into the short form of measurements. Inseparable from it in all forms of measurements, for life insurance, the army and navy, colleges, public schools, and the Young Men's Christian Association, is weight. Relative weight to height is acknowledged the best one all-round index of vitality.

CHAPTER IV.

ANTHROPOMETRIC TABLES.

In dealing with children, the first thing is health. Given that, and most things correct themselves. Asymmetry and postural deformity are secondary matters except as they affect health. We want to know whether the child is growing properly and where the emphasis of development ought to be placed. Certain measurements are important and for them we need fixed standards. It is important to know how far children depart from the normal in essentials, not in everything which can be measured.

I. WHAT IS NEEDED IN THE WAY OF A TABLE FOR CHILDREN?

1. It should contain, first of all, those measurements which are most valuable to indicate vitality.

2. It should show what the development of an individual ought to be, should provide a standard to which, with the aid of physical exercise he ought to find it possible to conform.

3. The group of measurements should be practicable as well as representative. To this end the measurements should be few, simple and easy to take, so that others than experts can use them. Little removal of clothing must be involved. The first and third items have been treated fully in the preceding chapter.

Turning now to the second necessity in a good table, "that it shall show what the development of an individual ought to be." No anthropometric standards are absolutely, but only approximately correct. No statement of the absolute ideal has been made or can be made. No statement even of the absolute type of development for a whole nation can be made, but such a statement may so nearly approximate the truth as to become of great practical benefit. The thing in demand is the nearest approximation of the truth. "As a rule" does not mean to exclude exceptions. All real and ultimate knowledge of physical facts is based upon cumulative evidence, upon the statement of what prevails among large numbers, upon correct statistical work.

Standards of development are not most valuable which only show how much one lacks of attaining some general type, but those which show how much he varies from the typical individual of his own class. The old percentile table which has been used most largely presents the distribution according to percentile grades of a large number of individuals (fifteen hundred to twenty-five hundred) as to each physical quality. It is useful in showing the deviation of the individual from the typical man of the whole number. It is valuable only for one line across it, the fifty per cent line or mean. Deviation from this mean indicates deviation from the typical individual, but shows nothing as to what the development of any given individual ought to be unless he is of mean height. (See percentile table on next page.)

The men who provided the data for this table were of different ages, and therefore at various stages of development; they were of different heights and therefore of different types of development. The short person has comparatively larger girths than the mean, the tall person is typically more slender. The girths of the eighty per cent man in height fall to about the sixty per cent line; while those of the twenty per cent man in height are to be found about the forty per cent line on a general percentile table. (Vid. "The Value of Per-

ANTHROPOMETRIC TABLE

VITAL PER CENT.	190.... Mo Da Hr	1	2	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	98	99	±p.e.	11 Mo
Weight		45 0 98 9	47 0 103 5	50 2 110 5	53 0 116 7	55 0 120 9	56 5 124 2	57 8 127 1	58 9 129 6	60 0 132 0	61 0 134 2	62 0 136 4	63 0 138 6	64 0 139 8	65 0 143 0	66 0 145 2	67 1 147 6	68 2 150 1	69 5 153 3	71 0 156 3	73 0 160 5	75 8 166 7	79 0 173 7	81 0 178 3	11 5	
Height		161 0 63 4	162 3 63 9	164 1 64 6	166 1 65 4	166 9 65 7	167 9 66 1	168 6 66 4	169 4 66 7	169 9 66 9	170 7 67 2	171 2 67 4	171 7 67 6	172 2 67 8	172 8 68 0	173 5 68 3	174 2 68 6	174 8 68 8	175 5 69 1	176 3 69 4	177 3 69 8	179 3 70 6	181 1 71 3	182 4 71 8	1 22	
Trunk Length		61 24 0	62 24 4	63 2 24 9	64 3 25 3	65 0 25 6	65 5 25 8	66 0 26 0	66 5 26 2	67 0 26 4	67 3 26 5	67 5 26 6	68 0 26 8	68 5 27 0	68 8 27 1	69 0 27 2	69 5 27 4	70 0 27 6	70 6 27 8	71 1 28 0	71 9 28 3	72 9 28 7	74 2 29 2	75 2 29 6	8	
Bd. Chest Con.		21 3 8 4	21 8 8 6	22 8 9 0	23 6 9 3	24 1 9 5	24 6 9 7	24 8 9 8	25 1 9 9	25 4 10 0	25 7 10 1	25 9 10 2	26 1 10 3	26 4 10 4	26 6 10 5	26 9 10 6	27 2 10 7	27 4 10 8	27 7 10 9	28 2 11 1	28 7 11 3	29 4 11 6	30 4 12 0	31 0 12 2	55	
Bd. Chest Exp.		23 4 9 2	24 1 9 5	24 8 9 8	25 7 10 1	26 4 10 4	26 9 10 6	27 2 10 7	27 7 10 9	27 9 11 0	28 2 11 1	28 4 11 2	28 7 11 3	28 9 11 4	29 2 11 5	29 4 11 6	29 7 11 7	30 2 11 9	30 4 12 0	31 0 12 2	31 7 12 5	32 5 12 8	38 2 13 1	34 0 13 4	6	
Bd. Waist		21 6 8 5	22 1 8 7	22 6 8 9	23 4 9 2	23 6 9 3	24 1 9 5	24 4 9 6	24 6 9 7	24 8 9 8	25 1 9 9	25 3 9 9	25 4 10 0	25 5 10 1	25 7 10 1	25 9 10 2	26 1 10 3	26 4 10 4	26 6 10 5	26 9 10 6	27 4 10 8	27 9 11 0	28 7 11 3	29 2 11 5	4	
Dp. Chest Con.		15 9 6 3	16 1 6 4	16 5 6 5	16 9 6 7	17 1 6 8	17 3 6 8	17 4 6 9	17 5 6 9	17 7 7 0	17 8 7 0	17 9 7 0	18 0 7 1	18 1 7 2	18 2 7 2	18 4 7 3	18 5 7 3	18 6 7 4	18 7 7 4	18 9 7 5	19 1 7 6	19 5 7 7	19 9 7 9	20 2 8 0	25	
Dp. Chest Exp.		16 4 6 5	16 8 6 6	17 5 6 9	18 1 7 1	18 5 7 3	18 9 7 4	19 2 7 6	19 4 7 7	19 7 7 7	19 9 7 8	20 1 7 9	20 3 8 0	20 5 8 1	20 7 8 2	21 0 8 3	21 2 8 4	21 4 8 5	21 7 8 6	22 0 8 7	22 5 8 9	23 1 9 1	23 8 9 4	24 2 9 6	45	
Dp. Abdomen		14 9 5 9	15 2 6 0	15 9 6 3	16 4 6 4	16 6 6 6	16 9 6 7	17 1 6 8	17 3 6 8	17 5 6 9	17 7 7 0	17 8 7 0	18 0 7 1	18 2 7 2	18 4 7 2	18 5 7 3	18 7 7 4	18 9 7 5	19 1 7 5	19 4 7 6	19 7 7 8	20 2 8 0	20 7 8 2	21 1 8 3	35	
Girth Chest, 9th Rib Con.		68 6 27 1	69 7 27 5	71 1 28 1	72 6 28 6	73 6 29 0	74 3 29 3	75 0 29 5	75 5 29 7	76 0 29 9	76 5 30 1	77 0 30 3	77 5 30 5	78 0 30 7	78 5 30 8	79 0 31 1	79 5 31 3	80 0 31 5	80 7 31 8	81 3 32 0	82 3 32 4	83 7 32 9	85 2 33 6	86 2 34 0	1 0	
Girth Chest, 9th Rib Exp.		70 7 27 8	72 2 28 4	74 5 29 3	76 6 30 2	78 0 30 7	79 0 31 1	80 0 31 5	80 9 31 8	81 6 32 1	82 4 32 4	83 1 32 7	83 8 33 0	84 6 33 3	85 3 33 6	86 0 33 9	86 8 34 2	87 6 34 5	88 6 34 9	89 7 35 3	91 1 35 9	93 2 36 7	95 5 37 6	96 9 38 2	1 5	
STRENGTHS																										
Lung Capacity		2 5 153 1	2 7 164 3	3 0 181 4	3 2 196 6	3 4 206 7	3 5 214 9	3 6 221 9	3 7 222 8	3 8 234 0	3 9 239 4	4 0 244 7	4 1 250 0	4 2 255 3	4 3 260 6	4 4 266 0	4 5 271 9	4 6 278 1	4 7 285 1	4 8 293 3	5 0 303 4	5 2 318 6	5 5 335 7	5 7 340 9	28 1	
Forearm R		26 1 57 5	28 5 62 7	32 2 70 8	35 4 77 9	37 6 82 7	39 3 86 5	40 8 89 8	42 1 92 7	43 4 95 5	44 5 98 0	45 7 100 5	46 8 103 0	47 9 105 5	49 1 108 0	50 2 110 5	51 5 113 3	52 8 116 2	54 3 119 5	56 0 123 3	58 2 128 1	61 4 135 2	65 1 143 3	67 5 148 5	13 2	
Forearm L		25 9 56 9	28 1 61 9	31 6 69 5	34 6 76 2	36 7 80 7	38 4 84 4	39 8 87 5	41 2 90 7	42 2 92 9	43 2 95 2	44 4 97 6	45 5 100 0	46 6 102 4	47 8 104 8	48 8 107 1	49 8 109 8	51 2 112 5	52 6 115 6	54 3 119 3	56 4 123 8	59 4 130 5	62 0 138 1	65 1 143 1	12 5	
Back		74 5 164 0	83 4 183 5	97 4 214 2	108 9 239 5	116 8 257 0	123 2 271 1	128 8 283 3	133 6 294 0	138 3 304 2	142 5 313 5	146 7 322 7	150 9 332 0	155 1 341 3	159 3 350 5	163 5 359 8	168 2 370 0	173 380 7	178 6 392 9	185 0 407 0	192 9 424 5	204 4 450 8	218 4 480 5	227 3 500 0	48 7	
Legs		102 2 224 8	112 3 247 0	127 7 281 0	141 5 311 2	150 5 331 2	157 9 347 4	164 2 361 3	169 8 373 6	175 1 385 3	179 9 395 8	184 7 406 4	189 5 417 0	194 3 427 6	199 1 438 2	203 9 448 7	209 2 460 4	214 8 472 7	221 1 486 6	228 5 502 8	237 5 522 8	251 3 553 0	266 7 587	276 8 609 2	55 7	
Shoulder Retractors		19 5 43 0	21 8 47 9	25 2 55 4	28 2 62 0	30 2 66 5	31 8 70 0	33 2 73 1	34 4 75 8	35 6 78 4	36 7 80 7	37 8 83 1	38 8 85 4	39 8 87 7	40 9 90 1	42 0 92 4	43 2 95 0	44 4 97 7	45 8 100 8	47 4 104 3	49 4 108 8	52 4 115 4	55 8 122 9	58 1 127 8	12 3	
SPECIAL																										
Bd. Shoulders		36 14 2	36 5 14 4	37 6 14 8	38 2 15 1	38 7 15 3	39 1 15 4	39 5 15 5	39 9 15 7	40 2 15 8	40 4 15 9	40 7 16 0	40 9 16 1	41 1 16 2	41 4 16 3	41 7 16 4	42 0 16 5	42 3 16 7	42 7 16 8	43 2 17 0	43 7 17 2	44 2 17 4	45 2 17 8	46 2 18 0	55	
Girth Neck		31 12 2	31 5 12 4	32 2 12 7	33 0 13 0	33 2 13 1	33 7 13 3	34 0 13 4	34 3 13 5	34 5 13 6	34 8 13 7	35 0 13 8	35 3 13 9	35 5 14 0	35 8 14 1	36 0 14 2	36 3 14 3	36 6 14 4	36 8 14 5	37 3 14 7	37 8 14 9	38 3 15 1	39 0 15 4	39 6 15 6	5	
Girth Chest Con.		75 2 29 6	76 2 30 0	78 2 30 8	79 8 31 4	80 9 31 9	81 8 32 2	82 6 32 5	83 2 32 8	83 8 33 0	84 4 33 2	85 1 33 5	85 6 33 7	86 2 33 9	86 8 34 2	87 3 34 4	88 0 34 6	88 6 34 9	89 4 35 2	90 3 35 6	91 4 36 0	93 0 36 6	94 9 37 4	96 1 37 8	1 2	
Girth Chest Exp.		80 0 31 5	81 6 32 1	83 9 33 0	86 0 33 9	87 4 34 4	88 5 34 8	89 4 35 2	90 2 35 5	91 0 35 8	91 8 36 1	92 5 36 4	93 2 36 7	93 9 37	94 7 37 3	95 4 37 6	96 2 37 9	97 0 38 2	98 3 38 7	99 3 39 1	100 6 39 7	102 5 40 4	104 8 41 3	106 4 41 9	1 5	
Girth Waist		62 8 24 7	64 1 25 2	65 3 25 7	67 8 26 7	69 0 27 1	69 9 27 5	70 7 27 8	71 4 28 1	72 1 28 4	72 7 28 6	73 3 28 9	74 0 29 1	74 6 29 3	75 1 29 6	75 8 29 8	76 4 30 1	77 2 30 4	78 0 30 7	78 9 31 1	80 0 31 5	82 6 32 5	83 8 33 0	85 1 33 5	1 27	
Girth R Forearm		22 6 8 9	23 1 9 1	23 8 9 4	24 4 9 6	24 8 9 7	25 1 9 9	25 3 10 0	25 6 10 1	25 8 10 2	26 0 10 2	26 2 10 3	26 4 10 4	26 6 10 5	26 8 10 6	27 0 10 7	27 2 10 7	27 5 10 8	27 8 10 9	28 1 11 1	28 5 11 2	29 1 11 5	29 7 11 7	30 2 11 9	43	
Girth L Forearm		22 6 8 9	23 1 9 1	23 8 9 4	24 4 9 6	24 8 9 7	25 1 9 9	25 3 10 0	25 6 10 1	25 8 10 2	26 0 10 2	26 2 10 3	26 4 10 4	26 6 10 5	26 8 10 6	27 0 10 7	27 2 10 7	27 5 10 8	27 8 10 9	28 1 11 1	28 5 11 2	29 1 11 5	29 7 11 7	30 2 11 9	43	
Girth R Up Arm Down		20 9 8 2	21 5 8 5	22 5 8 9	23 4 9 2	24 0 9 4	24 4 9 6	24 8 9 8	25 2 9 9	25 4 10 0	25 8 10 2	26 1 10 3	26 4 10 4	26 7 10 5	27 0 10 6	27 4 10 8	27 7 10 9	28 0 11 0	28 4 11 2	28 9 11 4	29 5 11 6	30 3 11 9	31 3 12 3	31 9 12 6	63	

General tables for the college age have been gotten out, based upon about the same number of observations, which make height the standard for comparative statement of development. Individuals of all ages are grouped according to height at certain fixed intervals, and the mean or average development for each height calculated. The element of weakness in this table lies in the fact that each group represents students of all ages, and therefore at all stages of development. The groups lack homogeneity in stage of development. The boy or girl of sixteen ought not to have the girths, breadths, depths, and strengths of the individual of twenty-five or thirty years, and does not. It fails, therefore, in the provision of a suitable basis for corrective work. Neither of the above tables can evidently be used for children of the school age.

Age tables* have been published which indicate the typical development of each age and sex for certain ages. The value and limitations of these tables have already been stated. The group which form the basis of their calculation are composed of individuals of the same age, and therefore at the same general stage of development, but they are of various distinct types of development, because of different heights. This is due to racial stock and to environment. The tall boy or girl cannot be made to conform to these standards. The twenty-five per cent, fifty per cent, and seventy-five per cent lines in these tables are of some use, for the reason that deviation beyond the twenty-five per cent or seventy-five per cent individual for any age is taken by good authorities to mean abnormality in development.† Such grouping lacks homogeneity in type of development, and therefore these tables do not show what it is possible for the individual to become. But the only tables which evidently can provide a true type for a given individual are those which give the normal for each height of each age. They do not lack homogeneity either in the matter of stage or type of development, and hence approximate very closely the provision of a true basis for corrective work. The accompanying height tables for each age and sex provide this standard of development for the individual. For children of the same age *height* should be the quality which forms the basis of the table, and all consideration of type be relative to height for the reason that height is practically an unalterable element in the problem. The short child cannot be "spliced" nor the tall "sawed off," but their development can be made to approach very nearly to the typical development for an individual of the height and age of each.

The question might be asked if these tables provide correct standards for every locality. My answer would be that all anthropometric standards are approximate; that errors of observation will be greater than the difference between the standards given herewith and those calculated for the whole United States; and that they are valuable for use in different localities.

(1) Because Nebraska is a very representative state, and all classes of society, even to the very best, attend public schools, private schools being practically unknown. From age seventeen to twenty the tables are based on net measurements from various sections of the country, and are therefore representative.

(2) It must be remembered that differences in type between various sections of the country are very slight. (Cf. conclusions of Bowditch, Porter, Boaz, MacDonald, and others.) These differences in general type are infinitely less than that between various types for the same age and sex in the same section.

(3) The provision of types for each height of each age obviates almost the whole difficulty, for the normal for each height is practically the same wherever calculated.

In connection with the use of the height tables for each age an important question arises,

* See Age Tables, between pages 36 and 37.

† You will note that a record of the development of a child each year, at least twice a year, is contemplated by these tables. On the back is to be found a place for the name of the individual, explanation of the table for his instruction, to save the time of

What is the value of M±D? This term has been taken to mean the amount of deviation permissible to an individual from the type for the height of his school grade. Any individual whose development is below the twenty-five per cent line, or above the seventy-five per cent line, is considered abnormal. This fact has given rise to a pedagogical principle: "That no pupil whose development varies more than ±D from the weight, etc., of the mean pupil of his height in a class which his mental output would otherwise entitle him to enter, shall be admitted to that class unless with the approval of a medical expert—if possible, a regularly appointed school physician, who shall testify that the pupil's strength will be equal to the strain" (Porter). I would change the statement a little by the use of the height tables. An individual who varies more than ±D from the typical development of his height and age should be required to pass a special physical examination, showing his physical ability to carry the work, before being allowed to advance to a higher school grade.

General low typical development is a matter for serious concern. Lack in individual physical qualities may or may not be of moment. The importance of each quality must determine. "Typical development" should be estimated, not in everything, but in essentials. The best means of doing this is to take the standard provided by the vitality coefficient, since it sets forth the combined value of all the vital measurements employed. (For information as to use of Vitality Coefficient, see back of Height Table for Boys twelve years of age, page 50.)

II. AGE TABLES.

1. *How to Plot Them.*

The age table is intended to show graphically the development of a child from the time of entering school until he leaves permanently. This can be shown annually, or, better, semi-annually. Measurements are given in both the common and the metric system, but preference is given to the latter for the reason that to the examiner the most convenient, as well as the most accurate, method of reading measurements is by this decimal system, and it is by far the most convenient system in which to calculate results. Most anthropometric and other scientific apparatus is graduated in its readings to this universal system. Approximate fractions for transposition into the common system of measurement are given in the margin of the table.* To the average mind the idea of development is conveyed more readily by graphical presentation than by figures, and it is little trouble to transfer height, weight, or any particular measurement about which the individual wishes to know to the exact equivalent in the ordinary system. Directions in the margin of the table indicate the general method of plotting. It may be well to repeat these in order, with some additions.

1. This table is divided into twelve sections, corresponding to the twelve prevailing school ages, five to sixteen years.

2. Each age section contains opposite the number indicating age the whole number of observations upon which the type is based.

3. The rest of this same line is devoted to a statement of the mean for the age (in black type).

4. The mean (M.) for the age is regarded as the normal or typical individual.

5. The twenty-five per cent line is placed below, the seventy-five per cent line above, the mean.

6. The blank space below is for the measurements taken at the beginning of the year; the space above for that at the end of six months, or of the school year.

7. The figures indicating the vitality coefficients of the given individual are written at the extreme right of the table, opposite the initials R. H. C., etc., defined in the heading.

8. Plot a given individual in the age-section indicated by his nearest birthday.

9. Write his first measurements for the year in the blank space below in black ink; his second in the blank space above in red ink.

10. Place the dots to the left of the figures.

11. Regard the middle of the space, including the mean (M.), as the fifty per cent line, that is, as the point of departure from the fifty per cent line (or mean) above or below.

12. Regard the middle of the spaces, including (25) and (75), as the twenty-five per cent and seventy-five per cent lines.

13. Where a measurement is greater than the mean (or fifty per cent line), place the dot proportionately between the fifty per cent line and the seventy-five per cent line; where it is less, in a corresponding position below the fifty per cent line.

14. After the dots are made, join them with bold lines. Use a ruler. Use black ink for the first measurement each year, red or some other color for the second measurement each year.

2. *The Value.*

This table is intended to be used both by the director and the pupil. To the director it may form an annual or semi-annual record of the growth and development of the boy for ready reference. To the pupil it may become, in addition, a means of stimulus and instruction through the use of information on the back. By reference to the back of the table you will note that this includes explanation of the meaning of the per cent lines and of the coefficients. It includes also a few general hygienic hints. Room is left for statement of special defects, and for the prescription of exercise for their correction. In the last space, local schedule of classes and other notices may be printed.

If the measurements are taken in the common system, and it is desired to plot them and to work out the coefficients in the same system, convert the formulæ on the back of the age table to the common system by use of the same multiples which are given on page 67, *i. e.*, multiply the regular formula for the R. H. C. by $\frac{1}{4}$ and that for the O. S. H. C. by 6.45.

Since age tables may be used year after year, the expense of a table is reduced to the minimum by their use. When they can be thus preserved carefully the cost averages less than one-third of a cent a year. Where institutions cannot afford to pay for tables for their membership, a charge of five or ten cents may be made to those who express a desire for the tables. This saves giving them to those who are not interested. It pays for the tables and for the expense of an assistant to plot them. Two or three cents will cover the expense of plotting the lines on them. It is more satisfactory to collect the money in advance.

For purposes of corrective work the age table is not entirely satisfactory. It has a separate and a definite range of function, however. As has already been stated, it is intended to show how a given child differs from the type of his age; it is intended to show semi-annually, or annually, the growth and development of the child as to individual physical qualities, which are important in determining vitality, from the time of entering to the time of leaving school permanently. Through its use also can be demonstrated the comparative growth in size and strength in the two halves of the year, that which is the indoor school period and that which contains the summer vacation. By measurement every three months the seasonal periods of growth may be estimated. It can be used to ascertain the effect of any form of exercise upon which the director wishes to make experiments as to physiological effects. For example, he may take two groups of boys of the same age, the same school grade, and with the same general heredity and environment, in whatever numbers are available, and give the one group systematic physical exercise of a certain definite type, and give the other group none for six months, examine all the boys and plot the average development at the beginning and close of the half year, and determine the value of any one kind of exercise as

HEALTH HINTS

(The director may check for emphasis those which apply to each case)

"The first requisite to success in life is to be a good animal." Health, strength and vitality do not come by chance but by obedience to natural laws. Study health. Select at least a half-dozen principles which you will obey, and hold to them rigidly. Form at least so many correct life habits. No universal rules will apply to all individuals. There must be adaptation to physical peculiarities, but a few general life habits are of permanent advantage to all.

1 *Respiration* should be deep and full. Take special breathing exercises for from five to ten minutes out of doors or before an open window upon rising, before retiring and during exercise. Ventilate your room day and night. Cover well and sleep with windows open, even in winter.

2 Eat regularly, lightly, slowly of plain *foods*, using plenty of grain and fruits. Use variety in different meals, avoid unwholesome mixtures at the same meal. Stimulants are unnatural and unnecessary. Never force yourself to eat. Eat very little when excited or very tired. No dietary will fit all cases: food must be adapted to the normal appetite of the individual. Care for the teeth regularly and escape many diseases.

3 Drink freely of pure *water* between meals. Take a glass or more of cool water upon rising and retiring. Have a regular hour for evacuation.

4 Wait for normal *circulation* after exercise before a bath, but do not cool off before the bath. After vigorous exercise, finish with lighter exercise to equalize the circulation. Keep the feet warm.

5 The best time to *bathe* is immediately after moderate exercise. Do not cool off before bathing. The more frequent the bath, the shorter it should be. Rub vigorously after a cool bath, secure a fine glow, become thoroughly alive. Use a graded bath, beginning with warm and finishing with a cool dash.

Never take a cool bath when exhausted, out of breath, within two hours after a full meal or just before such a meal. Wait about ten minutes after a bath before going out of doors.

6 Do not wear a tight belt or tight *clothing*, especially during exercise. It restricts circulation. Adapt weight of clothing to the season and the weather.

7 Rest is as essential as food. Take eight hours or more of *sleep*. To induce sleep where nervously tired, use one or more of the following simple remedies: Take a warm bath just before retiring, take breathing exercises for five to ten minutes, exercise lightly the muscles of the whole body with open windows, take a short run or long walk, followed by a light hand bath, or rub down with a coarse towel, or take a general massage.

8 Preserve your *eyesight*. Read only by a good light and let it fall over your left shoulder. Bathe the eyes frequently with clean, cool water.

9 *Exercise* regularly, vigorously with enthusiasm, viz.: Have a definite time for it, give it all your energy, enjoy it to the full.

Begin lightly, warm up to vigorous exercise and finish quietly. Practice corrective exercises first before becoming tired from other work.

Exercise must be *adapted* to the individual. For those *deficient* in development or incorrect in posture, special corrective work, hygienic gymnastics and lighter games; for the healthy and vigorous, the more vigorous gymnastics, games and athletics; for the average boy or girl, light exercise, corrective, hygienic and recreative. Emphasize games and all out of door life. If necessary be a crank about some game or games which is approved as good for *you* by the physical director.

Avoid exercise forbidden by the director or your physician. Avoid exhausting feats of strength. Take no vigorous exercise within two hours after a full meal. Never exercise until exhausted.

As long as you are able to be about, you will profit by exercise. You require it as much as food. Adapt it to your need as you do the food.

DEFECTS

Measurements *Posture, Deformity, Etc.*

listinct varieties of physical
the developmental effects.
most valuable contribution
tation of variety of exercise
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11. Regard the middle of the s that is, as the point of departure fro

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14. After the dots are made, j for the first measurement each yea each year.

2. *The Value.*

This table is intended to be us may form an annual or semi-annu ready reference. To the pupil it m tion through the use of informatic will note that this includes explana cients. It includes also a few gen defects, and for the prescription schedule of classes and other notic

If the measurements are tak and to work out the coefficients in age table to the common system *i. e.*, multiply the regular formula

Since age tables may be used minimum by their use. When t than one-third of a cent a year. membership, a charge of five or te tables. This saves giving them t for the expense of an assistant to plotting the lines on them. It is

For purposes of corrective w rate and a definite range of funct show how a given child differs fr or annually, the growth and de which are important in determini school permanently. Through it size and strength in the two h that which contains the summe sonal periods of growth may be e of exercise upon which the direc For example, he may take two with the same general heredity give the one group systematic p group none for six months, exa beginning and close of the half

PRESCRIPTION OF EXERCISE

FOR

I Neck (back of) _____

II Trunk _____

1 Breadth, Chest _____

Waist _____

2 Depth, Chest _____

Waist _____

3 Strength of Back _____

Upper _____

Lower _____

III Circulation _____

IV Respiration _____

V Digestion _____

VI Excretion _____

VII Nervous Function _____

VIII Injury, Atrophy or Deformity (Special Corrective Work) _____

_____

IX Posture and Carriage _____

X Recreation _____

1 Forms recommended _____

2 To be avoided _____

XI General Directions _____

SCHEDULE OF CLASSES

and Other Notices

contrasted with no exercise; or he may give the two groups two distinct varieties of physical training, say corrective work and hygienic work, and contrast the developmental effects. From the evolutionary point of view, work of this character is the most valuable contribution which can be made to the subject of physical training. The adaptation of variety of exercise to the ripening of the nerve centres must be worked out from the practical side by the laboratory method.

In determining the development of children from the age tables, the following observations are worthy of note:—

1. Deviation from the mean above or below in any quality indicates deviation from the type for the age.

2. The deviation of the twenty-five per cent or the seventy-five per cent line in an *ideal* series is the *probable deviation* of the series.

3. In these tables the *average corrected deviation* is used instead of the *probable deviation.**

4. The twenty-five per cent and seventy-five per cent lines in these tables have been corrected to represent approximately the per cent lines of ideal curves. Therefore they provide standards of development approximating the ideal quite as closely as if the total number of observations had been a thousand or more for each age.

5. Deviation below the twenty-five per cent line or above the seventy-five per cent line indicates abnormal departure from the type of the age, that is to say, the normal child is regarded as falling within the limits of $M \pm D$.

6. The upper line of the two enclosing the seventy-five per cent line may be regarded as the ninety per cent line; the lower line of the two enclosing the twenty-five per cent line may be regarded as the ten per cent line.

7. Double the average corrected deviation subtracted from the mean gives approximately the ten per cent line; added to the mean gives the ninety per cent line. Should a measurement differ from the fifty per cent line above or below by double the amount of the average corrected deviation, the point should be placed just outside the lines enclosing the seventy-five per cent and twenty-five per cent grades to indicate extreme abnormality.†

8. If the child shows a deviation from the mean of more than $\pm D$, a special physical examination should be made by the director before he is passed to a higher school grade.

9. If this deviation is above the seventy-five per cent line, and in qualities which indicate vitality, the director may, after simple inspection, consider it wise to pass the child without further examination; but if the over-development is in height or general dimensions of head it will be well to examine further to determine the physical needs of the child. If the deviation is below the twenty-five per cent line, and in qualities which aid in determining vitality, the case demands careful physical diagnosis.

10. One of the best means of determining in a general way the comparative vitality of children is through the use of the vitality coefficient. Should this coefficient drop below that of the preceding age, the director should ascertain the quality or qualities whose lack of development is chiefly responsible and give corrective exercises for the deficiency, or, where necessary, turn the case over to a practicing physician.

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* The average corrected deviation is obtained by taking the half sum of the deviations of the twenty-five per cent and seventy-five per cent lines in the actual series. A large number of experiments on weight, height, and other qualities showed that the difference between probable deviation and average corrected deviation is inappreciable when the calculation is based on the whole number of observations for the age. In the height tables, calculations for various qualities for each height of age seven showed an average difference between probable deviation and average corrected deviation of only .04. They are practically the same when calculated upon the basis of fifty to eighty individuals.

† This method is based on experimental work and approximates very closely the truth. Mathematically it is based on "Stieda's Table for the Calculation of Observations at any Distance from the Mean or Average within the Limits M + 5d and M − 5d." Twice the probable deviation (2d) includes 82.3 per cent of all the individuals of a series, or over 40 per cent above and 40 per cent below the mean.

III. HEIGHT TABLES.

The height tables differ in some respects in construction, in method of plotting, and in purpose and use. This form of table is intended to show the physical type for each height of each age and the vitality coefficient for each typical height. They are the same in general form of construction as the age table, but there are essential differences which will become evident by reference to the back of height table for boys twelve years of age. (See page 50.)

The explanatory matter on the back of this table is intended for the physical director or teacher. The description is fuller than that contained on the back of the tables which are given to the pupils. In addition to an outline description, including construction, plotting, and use of the tables, it contains a discussion of the coefficients.

In the calculation of the mean development for each height, all boys of the exact height indicated in the section, and above that height up to but under the height indicated in the next section, were taken. For example, the number of boys twelve years of age who were from one hundred and forty-two to one hundred and forty-four centimetres in height was fifty-nine. The mean development of these boys was calculated as to weight, breadths, girths, strengths, etc., and forms the type for the height, indicated by the black figures.

As a rule, breadths, depths, and girths increase with the height of the individual. As a rule, therefore, the vitality coefficient increases with the height, since it is directly affected by the larger dimensions of the trunk and by the function of the respiratory muscles.

Usually the measurements of the typical individual for each age fall between those of the fourth and the fifth typical height in the table. The vitality coefficient which is normal for that age falls in the same position, that is, is greater than that in height section four and less than that in height section five.

Of two individuals of the same height, the older individual is prevailingly better developed. Compare individuals of the same typical height in tables for successive ages. Usually development corresponds to height, but there are some exceptions to these rules. These exceptions are found most frequently in ages thirteen, fourteen, fifteen, and sixteen for boys, and in ages twelve, thirteen, and fourteen for girls—the ages where there is the widest diversity of development. The reason for some of these exceptions may be ascertained. For others no definite ground can yet be assigned, but they are all due to some lack of homogeneity in the individuals classed together.

In one or two ages where the number taken to form the type for certain heights is small, the resulting type may be questioned as not exact—for example, ages five and sixteen years. In age fourteen for boys, height group one hundred and forty-eight centimetres and above produces a better type than group one hundred and fifty-two centimetres and above, in one particular only, and that is chest expansion. In conclusions, page 4, Section 2, it is stated that maximum chest expansion for individual boys was found at fourteen years of age. As a rule, that is to say, forty-nine out of fifty-seven boys of remarkable chest expansion were over average height for their age, but of the eight who were not above average height seven were of this height group (one hundred and forty-eight centimetres and above) for age fourteen. The phenomenal boys of this age came from different cities. It is evident that this height group (one hundred and forty-eight centimetres and above) is not homogeneous, and the resulting type is not entirely satisfactory. The cause for this superior development has not been ascertained. In cases when the lack of homogeneity could be ascertained the disturbing element was eliminated. For example: On account of the limited number of measurements of girls seventeen years of age and above in high schools, some measurements of college girls were about to be used. It was found, however, that the college girls were prevailingly

In some few other cases no reason can be assigned for lack of homogeneity in height groups. The infrequency of the occurrence of these abnormal cases inspires confidence in the value of types according to height. If no exceptions to the rule that development varies directly with the height could be found in these tables they would be open to grave suspicion of too much uniformity. It is believed that if there were one thousand individuals of each age, discrepancies would be almost, if not entirely, eliminated. Before types are calculated for men, one thousand measurements of each age for men sixteen to thirty-six years will be secured from various parts of the country in accordance with the plan outlined in Chapter V.

In determining the development of children from the height tables the same observations as to deviation stated for the age tables apply, with the exception that deviation below the twenty-five per cent line or above the seventy-five per cent line indicates abnormal departure from the type of that individual height, and therefore *real* asymmetry not *relative* asymmetry, a statement of abnormality which holds out some definite information as to amount of deficiency and stimulates the hope of its removal. It is evident that a boy who is ten centimetres (over two and one-half inches) taller than the average boy of the same age cannot be made to conform to the average girths and strength tests; he will be larger, but not in proportion to his superiority in height. The tall individual is typically more slender. No more can the small boy of the same age, who is ten centimetres below the average height, be made by any system of training to conform to the typical development of the age. The short individual is typically more "stocky." They are of distinct types which demand each their own statement, and only the statement of that type which they may hope to attain will form a stimulus to the best efforts. For form of explanation of tables, and for prescription of exercise, etc., see back of height table for nineteen years of age, page 48, or for five years in the Appendix.

All tables from five to twenty years for boys and girls are printed with this same explanation, prescription of exercise, etc., on the back. A fuller explanation of the table for the physical director or teacher is provided on the back of a special issue of height tables for twelve years. (See Height Table for twelve years and explanation on the back, page 50; also price list, page 75.)

This explanation includes some statement of the vitality coefficients for the height tables.

Some Uses of Tables.

These tables furnish a means of determining the semi-annual and annual growth of a child from the beginning to the close of his school life. (For illustration of method see age table, inserted between pages 36 and 37.) On this table is shown the development of a child twice each year from the time he entered school at five years of age until he left it at ten years of age.

They show growth during six months of the school year with and without systematic exercise. (See height table for suppositional case, age eleven, page 40.)

They show the effect of various kinds of exercise upon growth during the six months of school life. (See height table for suppositional case, age twelve, page 41.) One had no exercise, the other general hygienic and corrective work. Dotted lines represent the case which had hygienic and corrective work.

They indicate the effect of the summer vacation upon growth during the six months which include it. (See age table, age thirteen, inserted between pages 36 and 37; also height table for age thirteen, page 42.) Three measurements are given. The first was taken in the spring, the second supposedly six months later after the summer vacation, and the last after six months of school work without regular exercise.

ANTHROPOMETRIC TABLE

for BOYS ELEVEN (11) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of six hundred and sixty Nebraska school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height (centimetres)	LENGTHS (CENT.) Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS	
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient	
															Growth with Exercise Growth without Exercise First Measurement	
	75		37 21	76 89	147 33	14 79	22 52	20 90	15 60	54 39	9 55	2 14	23 00	20 69	108	R H C
106	M	142	34 78	75 43	144 85	14 71	21 63	19 70	14 67	53 32	8 13	1 89	20 34	18 33	17 42	V C
	25		32 35	73 97	142 37	14 33	20 74	18 50	13 74	52 25	6 71	1 64	17 68	15 97	161 03	O S H C
	75		33 62	74 88	143 53	15 00	21 97	20 23	15 01	54 32	9 10	1 98	20 80	19 56	096	R H C
46	M	140	32 40	73 55	140 81	14 73	21 40	19 20	14 12	53 30	7 44	1 81	19 10	17 73	14 44	V C
	25		31 18	72 22	138 09	14 46	20 83	18 17	13 23	52 28	5 78	1 64	17 40	15 90	150 59	O S H C
	75		32 73	74 36	141 82	15 01	21 66	19 78	14 81	54 07	8 64	1 84	20 46	19 28	092	R H C
80	M	138	31 08	73 13	139 10	14 86	21 05	18 92	13 76	53 14	7 48	1 70	18 30	17 33	13 40	V C
	25		29 43	71 90	136 38	14 61	20 44	18 06	12 65	52 21	6 32	1 56	16 14	15 38	145 41	O S H C
	75		31 64	73 64	139 16	14 79	21 96	19 97	14 78	53 76	9 60	1 90	20 00	19 21	099	R H C
69	M	136	30 29	72 06	136 88	14 53	21 13	19 08	13 80	52 90	7 84	1 73	18 38	17 25	14 65	V C
	25		28 94	70 48	134 60	14 27	20 30	18 19	12 82	52 04	6 08	1 56	16 76	15 29	147 01	O S H C
	75		30 76	72 80	135 72	14 95	21 72	20 24	14 65	53 62	8 36	1 81	19 60	18 90	087	R H C
108	M	134	29 51	71 47	134 32	14 58	20 97	19 20	13 77	52 70	7 08	1 65	18 25	16 65	12 86	V C
	25		28 26	70 14	132 92	14 21	20 22	18 16	12 89	51 78	5 80	1 49	16 90	14 40	147 51	O S H C
	75		29 36	71 79	134 75	14 80	21 25	19 49	14 20	53 57	8 53	1 75	19 49	16 65	082	R H C
76	M	132	27 73	70 80	132 25	14 47	20 50	18 46	13 35	52 44	7 00	1 55	17 50	14 62	11 46	V C
	25		26 10	69 81	129 75	14 14	19 75	17 43	12 50	51 31	5 47	1 35	15 51	12 59	139 48	O S H C
	75		30 03	71 20	134 40	15 13	21 36	19 62	14 33	53 98	8 17	1 78	18 25	15 89	085	R H C
62	M	130	28 52	69 92	131 60	14 73	20 67	18 77	13 60	52 96	7 06	1 57	15 99	14 61	12 30	V C
	25		27 01	68 64	128 80	14 33	19 98	17 92	12 87	51 94	5 95	1 36	13 73	13 33	144 24	O S H C
	75		27 47	69 93	130 48	14 68	21 02	19 27	14 47	52 98	8 18	1 63	16 42	16 18	081	R H C
113	M	128	25 88	68 41	127 00	14 38	20 30	18 27	13 77	52 04	7 12	1 45	14 07	13 75	11 45	V C
	25		24 29	66 89	123 52	14 08	19 58	17 27	13 07	51 10	6 06	1 27	11 72	11 32	141 93	O S H C
Total 660		134 90	29 86	71 64	135 64	14 58	20 98	18 92	13 89	52 92	7 36	1 66	18 02	16 11	V C 13 33	Mean measurements for the age.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Measurements of .....

taken ..... 19..... by .....

ANTHROPOMETRIC TABLE

for BOYS TWELVE (12) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of five hundred and fifty-nine Nebraska school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line, the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS	
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient	
															Systematic Exercise	
															No Systematic Exercise	
	75		41 34	78 71	154 11	15 13	23 32	22 03	16 03	55 13	9 22	2 39	25 97	24 46	114	R H C
102	M	146	37 56	77 05	150 07	14 75	22 37	20 70	14 91	54 13	7 75	2 15	22 90	21 36	19 33	V C
	25		33 78	75 39	146 03	14 37	21 42	19 37	13 79	53 13	6 28	1 91	19 83	18 26	169 33	O S H C
	75		37 82	76 96	147 68	15 09	22 95	20 84	15 24	54 61	9 91	2 16	25 31	22 28	117	R H C
55	M	144	35 74	75 73	145 95	14 72	22 00	20 00	14 23	53 70	8 54	1 98	22 04	19 54	18 45	V C
	25		33 66	74 50	142 82	14 35	21 05	19 16	13 22	52 79	7 17	1 80	18 77	16 80	157 15	O S H C
	75		36 19	76 44	145 99	15 19	22 82	20 36	14 98	54 64	9 46	2 15	23 31	21 47	107	R H C
59	M	142	34 54	75 49	143 56	14 79	22 05	19 67	14 10	53 80	8 03	1 90	20 68	18 55	16 80	V C
	25		32 89	74 54	141 13	14 39	21 28	18 98	13 22	52 96	6 60	1 65	18 05	15 63	156 36	O S H C
	75		35 56	75 89	146 54	15 18	22 64	21 14	15 49	54 23	8 44	2 10	22 89	21 25	104	R H C
70	M	140	34 04	74 39	140 29	14 76	21 76	19 78	14 40	53 48	7 65	1 90	20 76	19 40	16 50	V C
	25		32 52	73 28	138 04	14 46	20 88	18 42	13 31	52 68	6 46	1 70	18 63	17 55	158 92	O S H C
	75		34 90	74 48	143 15	15 02	22 31	20 76	15 28	54 47	9 45	2 01	22 85	21 47	105	R H C
62	M	138	33 37	73 09	140 17	14 70	21 65	19 80	14 07	53 40	8 05	1 80	20 50	18 37	16 20	V C
	25		31 64	71 52	137 19	14 38	20 99	18 84	12 86	52 33	6 65	1 59	18 15	15 27	154 25	O S H C
	75		31 95	73 73	139 54	15 11	22 06	20 [illegible]	[illegible] 55	54 07	9 11	1 90	20 56	18 70	096	R H C
62	M	136	30 68	72 54	137 25	14 73	21 24	19 40	13 [illegible]	53 00	[illegible] 66	1 70	18 39	17 38	14 09	V C
	25		29 41	71 35	134 96	14 [illegible]	20 58	18 56	12 55	51 93	6 21	1 50	16 02	16 06	147 14	O S H C
	75		31 75	72 71	137 72	14 83	21 76	20 41	14 87	53 71	9 17	1 83	20 76	20 03	099	R H C
48	M	134	30 39	71 60	135 86	14 56	21 20	19 44	13 97	53 05	8 04	1 66	18 54	18 38	15 11	V C
	25		29 03	70 49	134 00	14 29	20 64	18 47	13 07	52 39	6 91	1 49	16 30	16 73	151 68	O S H C
	75		29 99	71 46	134 13	14 86	21 31	19 80	14 02	53 50	8 77	1 84	18 94	18 28	091	R H C
101	M	132	28 44	69 83	131 06	14 56	20 60	18 93	13 81	52 58	7 36	1 64	16 76	16 02	13 20	V C
	25		26 89	67 20	127 99	14 26	19 89	18 06	13 00	51 66	5 95	1 44	14 58	13 76	144 39	O S H C
Total 559		140 29	32 98	73 59	140 42	14 69	21 57	19 56	14 17	53 34	7 80	1 83	19 68	18 44	V C 15 55	Mean measurements for the age.

Measurements of .....

taken..... 19..... by .....

ANTHROPOMETRIC TABLE

for BOYS THIRTEEN (13) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of five hundred and fifteen Nebraska school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line, the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height (centimetres)	LENGTHS (CENT.) Weight (Kilos.)	Height Sitting	Span of Arms	BREADTHS (CENT.) Head	Chest	Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	Chest Expansion	STRENGTHS Lung Capacity (litres.)	Strength of Forearm, R (Kilos.)	Strength of Forearm, L (Kilos.)	COEFFICIENTS R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient	
			151.0	39.50	78.50	150.40	14.70	23.10	22.35	12.90	53.30	6.7	2.00	25.00	21.00	A Year Later
			149.1	38.10	78.00	149.00	14.65	22.90	22.10	12.80	53.10	6.7	2.00	24.30	20.00	Six Months Later
			145.8	36.4	77.00	146.50	14.60	22.50	21.60	12.40	52.80	6.5	1.80	23.10	18.10	In the Spring
	75		48 05	82 83	162 38	15 27	24 61	22 97	16 40	55 46	9 00	2 78	31 86	30 15	130	R H C
61	M	154	43 98	80 20	158 00	14 86	23 57	21 43	15 58	54 56	8 10	2 48	28 18	26 70	23 81	V C
	25		39 91	77 57	153 62	14 45	22 53	19 89	14 76	53 66	6 30	2 18	24 50	23 25	182 56	O S H C
	75		42 05	79 78	156 23	15 28	23 67	22 14	15 98	54 98	9 74	2 61	27 79	25 94	129	R H C
45	M	151	39 62	78 56	153 79	14 97	23 05	21 13	15 08	54 07	8 35	2 33	24 09	23 24	22 33	V C
	25		37 19	77 34	151 35	14 46	22 43	20 12	14 18	53 16	6 96	2 05	20 39	20 54	173 31	O S H C
	75		40 22	78 38	152 75	15 17	23 36	21 83	15 99	55 17	9 58	2 44	27 28	26 15	120	R H C
69	M	148	39 18	76 99	150 36	14 84	22 68	20 94	14 86	54 13	7 95	2 23	25 18	22 21	20 99	V C
	25		36 14	75 54	147 97	14 51	22 00	20 05	13 73	53 00	6 32	2 02	19 08	18 27	168 53	O S H C
	75		37 96	77 56	149 00	15 12	23 38	21 26	15 20	54 58	10 15	2 34	25 98	24 08	127	R H C
86	M	145	36 96	76 14	147 20	14 77	22 40	20 24	14 19	53 73	8 70	2 11	23 25	21 59	20 11	V C
	25		34 15	74 72	144 80	14 42	21 42	19 22	13 18	52 88	7 25	1 88	20 54	19 10	158 86	O S H C
	75		37 32	76 01	147 10	15 04	22 60	20 80	15 23	54 13	9 83	2 18	23 25	22 84	122	R H C
85	M	142	35 30	74 86	144 94	14 73	21 87	19 80	14 24	53 30	8 73	1 99	20 70	20 32	19 14	V C
	25		33 28	73 71	142 78	14 42	21 14	18 80	13 25	52 47	7 63	1 80	18 15	17 80	156 41	O S H C
	75		35 25	74 69	144 16	15 15	22 47	20 50	14 97	54 10	10 23	2 11	23 35	21 32	117	R H C
69	M	139	33 66	73 47	141 75	14 81	21 65	19 70	14 17	53 32	8 40	1 94	20 91	19 02	18 15	V C
	25		32 07	72 25	139 34	14 47	20 83	18 90	13 37	52 54	6 57	1 77	18 47	16 72	154 85	O S H C
	75		33 12	73 82	141 80	15 04	21 89	20 57	14 56	54 13	9 23	1 99	22 37	20 86	108	R H C
52	M	136	31 82	72 53	139 33	14 75	21 34	19 70	13 60	53 18	8 00	1 83	20 00	18 89	16 02	V C
	25		30 52	71 24	136 86	14 46	20 79	18 83	12 64	52 23	6 77	1 67	17 63	16 92	148 83	O S H C
	75		31 36	72 17	137 33	14 86	21 50	20 01	14 35	53 84	8 75	1 76	19 96	18 10	079	R H C
48	M	133	29 09	70 63	133 33	14 50	20 75	18 88	13 65	52 80	7 00	1 51	17 90	15 78	11 42	V C
	25		26 82	69 09	129 33	14 14	20 00	17 75	12 95	51 76	5 25	1 26	15 84	13 46	143 04	O S H C
Total 515		145 09	35 00	75 21	146 02	14 78	22 11	20 18	14 38	53 58	8 29	2 03	22 59	20 49	V C 18 28	Mean measurements for the age.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Measurements of .....

taken ..... 19..... by .....

ANTHROPOMETRIC TABLE

for BOYS FOURTEEN (14) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of four hundred and thirty-five Nebraska school children.)

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS	
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient	
		153	47.62	82.4	162.8	15.00	22.10	22.50	16.00	53.70	12.80	2.95	36.36	32.73	Large Vitality	
		153	39.8	76.2	151.70	14.90	20.40	17.10	15.40	55.10	1.40	1.80	33.18	27.27	Small Vitality	
	75		60 11	89 25	175 69	15 53	26 38	25 09	17 86	56 54	10 72	3 68	41 92	45 30	189	R H C
35	M	164	54 77	87 07	171 75	15 18	25 30	23 47	16 35	55 50	9 44	3 29	38 75	36 45	40 09	V C
	25		49 43	84 89	167 81	14 83	24 22	21 85	14 84	54 46	8 16	2 90	35 58	27 60	211 67	O S H C
	75		52 39	84 93	167 06	15 33	25 33	23 74	16 87	56 04	10 33	2 98	36 32	33 56	140	R H C
30	M	160	48 50	83 00	163 25	15 07	23 90	22 26	15 90	54 83	8 50	2 64	31 90	28 86	26 70	V C
	25		44 61	81 07	159 44	14 81	22 47	20 78	14 93	53 62	6 67	2 30	27 48	24 16	190 37	O S H C
	75		47 32	82 02	164 18	15 53	24 91	22 90	16 97	56 10	11 23	2 86	33 56	29 81	164	R H C
48	M	156	45 50	80 70	160 80	15 10	23 78	23 00	15 87	55 00	9 70	2 64	29 73	26 81	30 85	V C
	25		43 68	79 38	157 42	14 67	22 65	21 10	14 77	53 90	8 17	2 42	25 90	23 81	187 92	O S H C
	75		45 36	80 41	159 99	15 27	24 13	22 78	16 48	54 99	9 46	2 65	31 80	29 59	123	R H C
79	M	152	42 33	78 84	156 33	14 91	23 15	21 71	15 16	54 13	7 91	2 37	27 38	25 08	21 75	V C
	25		39 30	77 27	153 67	14 65	22 17	20 64	13 84	53 28	6 36	2 09	22 96	20 57	176 37	O S H C
	75		41 60	79 06	154 65	15 29	23 89	21 60	16 15	55 34	10 71	2 64	27 60	26 90	144	R H C
80	M	148	39 46	77 53	151 86	14 91	22 75	20 57	14 90	54 30	9 01	2 37	25 00	23 03	24 39	V C
	25		37 32	76 00	149 07	14 53	21 61	19 54	13 65	53 26	7 31	2 10	22 40	19 16	169 05	O S H C
	75		39 06	77 33	149 42	15 16	23 20	21 69	16 06	54 72	9 64	2 31	25 48	24 76	122	R H C
78	M	144	36 85	76 05	147 00	14 82	22 56	20 59	14 80	53 85	8 90	2 14	23 15	22 04	20 55	V C
	25		34 64	74 77	144 58	14 48	21 92	19 49	13 54	52 98	6 76	1 97	20 82	19 32	168 63	O S H C
	75		36 38	75 82	146 19	14 99	22 61	21 49	15 60	54 13	9 87	2 10	25 59	22 85	115	R H C
49	M	140	34 74	74 40	144 50	14 68	22 08	20 45	14 25	53 30	8 46	1 91	23 79	20 64	18 59	V C
	25		33 10	72 98	142 81	14 37	21 55	19 41	12 90	52 47	7 05	1 72	19 99	18 43	161 04	O S H C
	75		32 35	73 62	140 40	14 96	22 15	20 35	14 82	54 09	9 15	1 87	21 23	21 47	104	R H C
36	M	136	30 76	72 14	138 00	14 63	21 20	19 20	13 87	53 10	8 00	1 76	18 57	18 86	15 39	V C
	25		29 17	70 66	135 60	14 30	20 25	18 05	12 92	52 11	6 85	1 65	15 91	16 25	148 61	O S H C
Total 435		151 02	39 73	78 06	152 43	14 89	22 78	21 00	15 07	54 19	8 46	2 30	25 37	23 65	V C 21 97	Mean measurements for the age.

.247
.023
45.49
8.21
196.47
148.81

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Measurements of.....

taken.....19..... by.....

ANTHROPOMETRIC TABLE

for BOYS FIFTEEN (15) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of three hundred and twenty-seven Nebraska school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS		
		195.9	76.81	94.90	180.9	14.10	20.60	25.20	12.90	51.30	17	3.44	42.72	50.00	Tall—Large Vitality		
		179.80	24.77	60.90	131.30	14.40	16.50	18.50	12.60	52.20	11	1.84	13.44	13.64	Short—Small Vitality		
	75		64 54	92 02	181 77	15 53	27 56	25 80	18 78	57 16	13 09	3 54	47 60	45 00	223	R H C	.222
26	M	170	60 45	89 83	178 33	15 30	26 00	24 30	17 65	56 13	10 75	3 52	36 97	34 54	52 21	V C	61.50
	25		56 36	87 64	174 89	15 07	24 50	22 80	16 52	55 10	8 41	3 20	26 34	24 08	234 55	O S H C	276.95
	75		57 31	89 11	177 19	15 55	26 27	24 28	18 32	56 14	11 56	3 44	42 42	40 43	171	R H C	
39	M	166	54 43	86 58	172 56	15 13	25 27	23 05	17 34	55 14	9 00	3 15	37 00	35 00	37 70	V C	
	25		51 55	84 05	167 93	14 71	24 27	21 82	16 36	54 14	6 44	2 86	31 58	29 57	220 76	O S H C	
	75		55 88	86 72	169 75	15 48	25 58	23 99	19 01	56 34	10 62	3 57	40 28	38 38	166	R H C	
46	M	162	52 95	85 00	166 00	15 08	24 60	22 90	17 43	55 30	8 67	3 11	34 32	32 36	36 16	V C	
	25		50 02	83 28	162 25	14 68	23 62	21 81	15 85	54 26	6 72	2 65	28 36	26 34	217 20	O S H C	
	75		52 51	85 01	164 35	15 31	25 13	23 93	17 80	55 49	10 23	3 13	37 03	33 12	151	R H C	
49	M	158	48 98	83 31	162 63	15 08	24 06	22 35	16 43	54 58	8 50	2 80	32 38	28 11	30 28	V C	
	25		45 45	81 61	160 91	14 85	22 99	20 77	15 06	53 67	6 77	2 47	27 73	23 10	201 03	O S H C	
	75		47 33	82 49	161 00	15 16	24 65	22 94	16 83	55 38	10 20	2 73	32 27	29 56	135	R H C	
57	M	154	44 54	80 92	158 75	14 88	23 63	21 81	15 80	54 54	8 36	2 49	28 03	25 68	25 50	V C	
	25		41 75	79 35	156 50	14 69	22 61	20 68	14 77	53 70	6 52	2 25	23 79	21 80	188 62	O S H C	
	75		43 75	80 40	154 98	15 28	23 48	22 21	16 62	55 07	9 63	2 69	30 72	27 10	141	R H C	
36	M	150	41 59	79 00	153 00	14 90	22 90	21 27	15 25	54 07	8 50	2 48	27 77	24 77	24 36	V C	
	25		39 43	77 60	151 02	14 52	22 32	20 33	13 88	53 07	7 37	2 27	44 82	22 44	173 34	O S H C	
	75		41 21	78 09	152 39	15 15	23 02	22 41	16 13	54 86	9 79	2 52	29 40	26 72	122	R H C	
41	M	146	38 68	76 94	149 75	14 87	22 46	21 30	15 15	54 03	8 19	2 17	26 51	23 24	21 26	V C	
	25		36 15	75 79	147 11	14 59	21 90	20 19	14 17	53 20	6 59	1 82	23 62	19 76	174 69	O S H C	
	75		37 34	76 45	148 56	14 75	23 79	21 21	15 15	54 59	9 53	2 33	24 98	23 18	109	R H C	.156
33	M	142	35 68	74 61	145 31	14 41	22 65	20 90	14 37	53 34	7 75	1 99	20 76	20 45	17 86	V C	18.43
	25		34 02	72 77	142 00	14 07	21 51	19 59	13 59	52 09	5 97	1 65	16 54	17 72	164 41	O S H C	118.23
Total 327		158 18	46 95	81 68	160 33	15 00	23 68	22 00	16 07	54 55	8 44	2 64	28 85	24 68	V C 26 09	Mean measurements for the age.	

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; Kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Measurements of .....

taken ..... 19..... by .....

ANTHROPOMETRIC TABLE

for BOYS SIXTEEN (16) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of two hundred and eighteen Omaha school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS		
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient		
		182.9	64.54	86.10	185.40	15.70	24.80	19.00	16.40	56.50	9.20	3.60	42.27	41.54	Low O. S. H. C		
		177.8	52.24	83.82	175.60	13.90	23.00	21.50	13.80	55.40	5.80	3.00	34.79	31.36	Low R. H. C.		
	75		67 73	94 33	186 30	15 90	27 60	25 94	19 24	57 33	11 08	4 13	41 62	43 18	206	R H C	.183
25	M	173	64 69	91 23	182 13	15 32	26 55	24 90	18 10	56 48	9 40	3 79	37 27	36 36	50 58	V C	.178 33.12
																	22.69
	25		60 45	88 17	177 96	15 34	25 50	23 86	16 96	55 63	7 72	3 45	33 52	29 54	245 60	O S H C	170.04 225.49
	75		61 21	90 89	180 10	15 56	26 45	25 60	19 06	56 57	10 79	3 95	49 21	44 61	201	R H C	
25	M	170	58 07	89 42	176 38	15 25	25 65	24 10	18 10	55 70	9 45	3 61	37 73	34 32	47 54	V C	
	25		54 93	87 95	172 66	14 94	24 85	22 60	17 14	54 83	8 11	3 27	26 25	24 03	236 92	O S H C	
	75		61 02	89 16	174 88	15 67	27 00	24 83	17 95	57 00	11 36	3 83	45 45	43 37	191	R H C	
24	M	167	56 36	87 33	172 75	15 30	26 00	23 73	17 40	56 00	9 50	3 36	38 18	36 55	43 23	V C	
	25		51 70	85 50	170 62	14 93	25 00	22 63	16 85	55 00	7 64	2 89	30 91	29 73	226 25	O S H C	
	75		57 27	87 09	172 32	15 96	26 33	24 98	18 19	56 35	10 27	3 43	36 86	35 11	164	R H C	
31	M	164	55 00	85 72	169 50	15 43	25 10	23 55	17 05	55 15	8 57	3 13	29 55	29 09	35 46	V C	
	25		52 73	84 35	166 68	14 90	23 87	22 12	15 91	53 95	6 87	2 83	22 24	23 07	216 78	O S H C	
	75		55 60	86 92	168 75	15 57	25 64	24 27	17 34	55 74	10 49	3 52	42 46	39 32	178	R H C	
36	M	161	53 88	85 00	165 75	15 10	24 66	23 00	16 20	55 00	9 00	3 18	36 82	32 73	36 98	V C	
	25		50 16	83 08	162 75	14 63	23 68	21 73	15 06	54 26	7 51	2 84	31 18	26 14	208 01	O S H C	
	75		49 85	85 29	167 85	15 25	25 07	24 05	17 53	55 15	11 13	3 29	38 18	33 26	161	R H C	
25	M	158	47 12	83 75	164 25	15 01	24 00	22 80	16 40	54 40	8 88	2 87	33 52	28 94	32 81	V C	
	25		44 39	82 21	160 65	14 77	22 93	21 55	15 27	53 65	6 63	2 45	28 86	24 62	203 42	O S H C	
	75		46 50	82 59	160 58	15 28	24 45	23 60	17 24	55 15	11 17	2 80	32 27	31 90	141	R H C	
20	M	155	44 09	80 67	158 33	14 90	23 35	22 60	16 40	53 90	8 70	2 51	28 18	27 50	27 00	V C	
	25		41 59	78 75	156 08	14 52	22 25	21 60	15 56	52 65	6 23	2 22	24 09	23 10	191 64	O S H C	
	75		42 73	80 63	159 45	15 18	24 40	22 56	16 65	55 37	9 35	2 59	33 75	30 82	123	R H C	
32	M	153	40 00	78 33	151 75	14 84	23 50	21 30	15 30	54 37	8 07	2 32	28 64	26 14	21 75	V C	
	25		37 27	76 03	144 05	14 50	22 60	20 04	13 95	53 37	6 79	2 05	23 53	21 46	176 61	O S H C	
Total 218		163 73	52 90	85 21	168 21	15 14	25 04	23 19	16 80	54 73	8 80	3 14	33 31	29 64	V C 35 58	Mean measurements for the age.	

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Measurements of.....

taken..... 19..... by.....

ANTHROPOMETRIC TABLE

for BOYS NINETEEN (19) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the *net* measurements of seven hundred and ninety-six Nebraska, Massachusetts, and Connecticut school boys.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line; the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height	Weight	LENGTHS		BREADTHS			DEPTH	GIRTHS		STRENGTHS			COEFFICIENTS	
				Height Sitting	Span of Arms	Head	Chest	Waist	Chest	Head	Chest Expansion	Lung Capacity	Forearm, Right	Forearm, Left	R H C — Respiratory-Height Coefficient V C — Vitality Coefficient O S H C — Organic Strength-Height Coefficient	
	75		73 42	97 05	194 25	16 24	28 30	27 10	20 04	58 60	10 10	5 13	58 55	55 68	234	R H C
58	M	182	67 61	94 00	191 50	15 78	27 00	26 15	19 10	57 50	8 45	4 65	54 91	51 82	55 68	V C
	25		61 80	90 95	188 75	15 32	25 70	25 20	18 16	56 40	6 80	4 17	51 27	47 96	260 02	O S H C
	75		68 83	93 13	189 50	16 25	28 38	26 90	20 37	58 25	9 95	4 84	59 59	52 72	207	R H C
77	M	179	65 11	93 63	187 00	15 90	27 13	25 80	19 26	57 30	8 35	4 47	54 82	47 95	54 67	V C
	25		61 39	92 13	184 50	15 55	25 88	24 70	18 15	56 35	6 75	4 10	50 05	43 18	264 40	O S H C
	75		67 98	94 28	188 00	16 16	27 83	26 74	19 96	57 91	10 34	4 58	55 56	50 20	196	R H C
92	M	176	64 09	92 36	183 00	15 70	26 76	25 45	19 01	57 03	8 35	4 17	50 80	45 00	50 65	V C
	25		60 20	90 44	178 00	15 24	25 69	24 16	18 06	56 15	6 36	3 76	46 04	39 80	258 22	O S H C
	75		66 05	91 83	182 23	15 73	27 59	27 09	19 30	58 04	9 31	4 43	57 63	53 94	18	R H C
129	M	173	61 93	90 41	179 10	15 38	26 67	25 80	18 59	57 20	7 74	4 10	50 36	47 05	45 95	V C
	25		57 81	88 99	175 97	15 03	25 75	24 51	17 88	56 36	6 17	3 77	43 09	40 16	252 69	O S H C
	75		64 70	90 86	180 61	16 11	27 99	26 39	19 78	58 27	9 26	4 33	50 44	49 76	178	R H C
131	M	170	60 60	89 70	177 33	15 75	26 66	25 47	18 63	57 20	7 68	3 98	46 32	44 09	45 27	V C
	25		56 50	88 54	174 05	15 39	25 33	24 55	17 48	56 13	6 10	3 63	42 20	38 42	253 98	O S H C
	75		62 84	90 46	177 50	16 13	27 45	26 47	19 33	58 75	9 00	4 26	50 37	44 96	176	R H C
135	M	167	58 91	88 71	174 75	15 75	26 05	25 18	18 46	57 40	7 62	3 89	45 91	40 83	43 79	V C
	25		54 98	86 96	172 00	15 37	24 65	23 89	17 59	56 05	6 24	3 52	41 45	36 70	248 94	O S H C
	75		60 17	89 17	170 96	15 68	26 59	25 97	19 25	56 95	8 67	3 97	47 90	46 07	155	R H C
102	M	164	56 95	88 00	168 30	15 30	25 68	25 23	18 33	56 20	7 08	3 63	43 18	40 76	38 53	V C
	25		53 73	86 83	165 64	14 92	24 77	24 49	17 41	55 45	5 49	3 29	38 46	35 45	248 10	O S H C
	75		56 75	88 64	170 50	15 72	26 72	26 60	18 93	57 08	7 79	3 84	47 38	46 58	150	R H C
72	M	161	52 67	86 30	165 75	15 33	25 47	25 25	18 00	56 20	6 98	3 49	43 18	40 00	36 34	V C
	25		48 59	83 96	161 00	14 94	24 22	23 90	17 07	55 32	6 17	3 14	38 98	33 42	242 43	O S H C
Total 796		171 81	61 71	90 39	177 61	15 75	27 35	25 70	19 03	57 03	8 40	4 10	47 55	43 64	V C 53 23	Mean measurements for the age.

All measurements are given in the Metric System. To transpose centimetres to inches, multiply by .393; kilogrammes to pounds, multiply by 2.2; litres to cubic inches, multiply by 61.

Measurements of.....

taken.....19..... by.....

litres to cubic inches multiply by 61.

HEALTH HINTS

(The director may check for emphasis those which apply to each case)

"The first requisite to success in life is to be a good animal." Health, strength and vitality do not come by chance but by obedience to natural laws. Study health. Select at least a half-dozen principles which you will obey, and hold to them rigidly. Form at least so many correct life habits. No universal rules will apply to all individuals. There must be adaptation to physical peculiarities, but a few general life habits are of permanent advantage to all.

1 *Respiration* should be deep and full. Take special breathing exercises for from five to ten minutes out of doors or before an open window upon rising, before retiring and during exercise. Ventilate your room day and night. Cover well and sleep with windows open, even in winter.

2 Eat regularly, lightly, slowly of plain *foods*, using plenty of grain and fruits. Use variety in different meals, avoid unwholesome mixtures at the same meal. Stimulants are unnatural and unnecessary. Never force yourself to eat. Eat very little when excited or very tired. No dietary will fit all cases: food must be adapted to the normal appetite of the individual. Care for the teeth regularly and escape many diseases.

3 Drink freely of pure *water* between meals. Take a glass or more of cool water upon rising and retiring. Have a regular hour for evacuation.

4 Wait for normal *circulation* after exercise before a bath, but do not cool off before the bath. After vigorous exercise, finish with lighter exercise to equalize the circulation. Keep the feet warm.

5 The best time to *bathe* is immediately after moderate exercise. Do not cool off before bathing. The more frequent the bath, the shorter it should be. Rub vigorously after a cool bath, secure a fine glow, become thoroughly alive. Use a graded bath, beginning with warm and finishing with a cool dash.

Never take a cool bath when exhausted, out of breath, within two hours after a full meal or just before such a meal. Wait about ten minutes after a bath before going out of doors.

6 Do not wear a tight belt or tight *clothing*, especially during exercise. It restricts circulation. Adapt weight of clothing to the season and the weather.

7 Rest is as essential as food. Take eight hours or more of *sleep*. To induce sleep where nervously tired, use one or more of the following simple remedies: Take a warm bath just before retiring, take breathing exercises for five to ten minutes, exercise lightly the muscles of the whole body with open windows, take a short run or long walk, followed by a light hand bath, or rub down with a coarse towel, or take a general massage.

8 Preserve your *eyesight*. Read only by a good light and let it fall over your left shoulder. Bathe the eyes frequently with clean, cool water.

9 *Exercise* regularly, vigorously with enthusiasm, viz.: Have a definite time for it, give it all your energy, enjoy it to the full.

Begin lightly, warm up to vigorous exercise and finish quietly. Practice corrective exercises first before becoming tired from other work.

Exercise must be *adapted* to the individual. For those *deficient* in development or incorrect in posture, special corrective work, hygienic gymnastics and lighter games; for the healthy and vigorous, the more vigorous gymnastics, games and athletics; for the average boy or girl, light exercise, corrective, hygienic and recreative. Emphasize games and all out of door life. If necessary be a crank about some game or games which is approved as good for *you* by the physical director.

Avoid exercise forbidden by the director or your physician. Avoid exhausting feats of strength. Take no vigorous exercise within two hours after a full meal. Never exercise until exhausted.

As long as you are able to be about, you will profit by exercise. You require it as much as food. Adapt it to your need as you do the food.

DEFECTS

Measurements — *Posture, Deformity, Etc.*

The Measurements & Anthropometric Table

No. _____

Of _____

OF THE

_____

City _____

EXPLANATION

1 The table on the other side of this sheet shows how you compare with others of the *same age, sex and height.*

2 There are eight different sections to this table for eight different typical heights for your age. Your measurements are plotted in the section which corresponds to your height.

3 If you are well developed in every particular, the line across the table, which joins the dots showing development of individual qualities, will follow closely the black figures of your height-section. The better your measurements are, the more nearly straight will be this line which represents them.

4 In each section the line of figures opposite 75 represents the 75% line, opposite M represents the mean or normal, and opposite 25 represents the 25% line. Should the line representing your measurements vary above the 75% line or below the 25% line of figures for any measurement, your development in this particular is abnormal. When it is below the 25% line, it may be necessary for you to take special corrective exercises. The physical director will point out any special lack under "Defects," and tell you how to correct it under "Prescription of Exercise."

5 If your Vitality Coefficient (V.C.) is very low, you require plenty of out of door exercise. Take only such corrective gymnastics and games as the physical director or your family physician may encourage.

DEFECTS

Measurements — *Posture, Deformity, Etc.*

48

PRESCRIPTION OF EXERCISE

FOR

I Neck (back of) _____

II Trunk _____

1 Breadth, Chest _____

Waist _____

2 Depth, Chest _____

Waist _____

3 Strength of Back _____

Upper _____

Lower _____

III Circulation _____

IV Respiration _____

V Digestion _____

VI Excretion _____

VII Nervous Function _____

VIII Injury, Atrophy or Deformity (Special Corrective Work) _____

_____

IX Posture and Carriage _____

X Recreation _____

1 Forms recommended _____

2 To be avoided _____

XI General Directions _____

ANTHROPOMETRIC TABLE

for BOYS TWELVE (12) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of five hundred and fifty-nine Nebraska school children.)

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS		
	75		41 34	78 71	154 11	15 13	23 32	22 03	16 03	55 13	9 22	2 39	25 97	24 46	114	R H C	
102	M	146	37 56	77 05	150 07	14 75	22 37	20 70	14 91	54 13	7 75	2 15	22 90	21 36	19 33	V C	
	25		33 78	75 39	146 03	14 37	21 42	19 37	13 79	53 13	6 28	1 91	19 83	18 26	169 33	O S H C	
	75		37 82	76 96	147 68	15 09	22 95	20 84	15 24	54 61	9 91	2 16	25 31	22 28	117	R H C	
55	M	144	35 74	75 73	145 35	14 73	22 60	20 00	14 23	53 70	8 54	1 98	22 04	19 54	18 45	V C	
	25		32 66	74 50	142 82	14 35	21 05	19 16	13 22	52 79	7 17	1 80	18 77	16 80	157 15	O S H C	
	75		36 19	76 44	145 99	15 19	22 82	20 36	14 98	54 64	9 46	2 15	23 31	21 47	107	R H C	
59	M	142	34 54	75 49	143 56	14 79	22 05	19 67	14 10	53 80	8 03	1 90	20 68	18 55	16 80	V C	
	25		32 89	74 54	141 13	14 39	21 28	18 98	13 22	52 96	6 60	1 65	18 05	15 63	156 36	O S H C	
	75		35 56	75 50	142 54	15 06	22 64	21 14	15 49	54 28	8 84	2 10	22 89	21 25	104	R H C	
70	M	140	34 04	74 39	140 29	14 76	21 76	19 78	14 40	53 48	7 65	1 90	20 76	19 40	16 50	V C	
	25		32 52	73 28	138 04	14 46	20 88	18 42	13 31	52 68	6 46	1 70	18 63	17 55	158 92	O S H C	
	75		34 90	74 48	143 15	15 02	22 31	20 76	15 28	54 47	9 45	2 01	22 85	21 47	105	R H C	
62	M	138	33 27	73 00	140 17	14 70	21 65	19 80	14 07	53 40	8 05	1 80	20 50	18 37	16 20	V C	
	25		31 64	71 52	137 19	14 38	20 99	18 84	12 86	52 33	6 65	1 59	18 15	15 27	154 25	O S H C	
	75		31 95	73 73	139 54	15 11	22 06	20 24	14 55	54 07	9 11	1 90	20 56	18 70	096	R H C	
62	M	136	30 68	72 54	137 25	14 73	21 32	19 40	13 55	53 00	7 66	1 70	18 29	17 38	14 09	V C	
	25		29 41	71 35	134 96	14 35	20 58	18 56	12 55	51 93	6 21	1 50	16 02	16 06	147 14	O S H C	
	75		31 75	72 71	137 72	14 83	21 76	20 41	14 87	53 71	9 17	1 83	20 76	20 03	099	R H C	
48	M	134	30 39	71 60	135 86	14 56	21 20	19 44	13 97	53 05	8 04	1 66	18 54	18 38	15 11	V C	
	25		29 03	70 49	134 00	14 29	20 64	18 47	13 07	52 39	6 91	1 49	16 30	16 73	151 68	O S H C	
	75		29 99	71 46	134 13	14 86	21 31	19 80	14 62	53 50	8 77	1 84	18 94	18 28	091	R H C	
101	M	132	28 44	69 83	131 06	14 56	20 60	18 93	13 81	52 58	7 36	1 64	16 76	16 02	13 20	V C	
	25		26 89	67 20	127 99	14 26	19 89	18 06	13 00	51 66	5 95	1 44	14 58	13 76	144 39	O S H C	
Total 559		140 29	32 98	73 39	140 42	14 69	21 57			53 34	7 80	1 83	19 68	18 44	V C 15 55	Mean measurements	

Directions for Plotting.

1. Place dots to left of figures.
2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line, the lower line of the two enclosing the 25 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

ANTHROPOMETRIC TABLE

for BOYS THIRTEEN (13) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of five hundred and fifteen Nebraska school children.)

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS		
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient		
	75		48 05	82 83	162 38	15 27	24 61	22 97	16 40	55 46	9 90	2 78	31 86	30 15	130	R H C	
61	M	154	43 98	80 20	158 00	14 86	23 57	21 43	15 58	54 56	8 10	2 48	28 18	26 70	23 81	V C	
	25		39 91	77 57	153 62	14 45	22 53	19 89	14 76	53 66	6 30	2 18	24 50	23 25	182 56	O S H C	
	75		42 05	79 78	156 23	15 28	23 67	22 14	15 98	54 98	9 74	2 61	27 79	25 94	129	R H C	
45	M	151	39 62	78 56	153 79	14 87	23 05	21 13	15 08	54 07	8 35	2 33	24 09	23 24	22 33	V C	
	25		37 19	77 34	151 35	14 46	22 43	20 12	14 18	53 16	6 96	2 05	20 39	20 54	173 31	O S H C	
	75		40 22	78 38	152 75	15 17	23 36	21 83	15 99	55 17	9 58	2 44	27 28	26 15	120	R H C	
69	M	148	38 18	76 96	150 36	14 84	22 68	20 94	14 86	54 13	7 95	2 23	23 18	22 21	20 99	V C	
	25		36 14	75 54	147 97	14 51	22 00	20 05	13 73	53 09	6 32	2 02	19 08	18 27	168 53	O S H C	
	75		37 96	77 56	149 60	15 12	23 38	21 26	15 20	54 58	10 15	2 34	25 98	24 08	127	R H C	
86	M	145	36 06	76 14	147 20	14 77	22 40	20 24	14 19	53 73	8 70	2 11	23 25	21 59	20 11	V C	
	25		34 15	74 72	144 80	14 42	21 42	19 22	13 18	52 88	7 25	1 88	20 54	19 10	158 86	O S H C	
	75		37 32	76 01	147 10	15 04	22 60	20 80	15 23	54 13	9 83	2 18	23 25	22 84	122	R H C	
85	M	142	35 30	74 86	144 94	14 73	21 87	19 80	14 24	53 30	8 73	1 99	20 70	20 32	19 14	V C	
	25		33 28	73 71	142 78	14 42	21 14	18 80	13 25	52 47	7 63	1 80	18 15	17 80	156 41	O S H C	
	75		35 25	74 69	144 16	15 15	22 47	20 50	14 97	54 10	10 23	2 11	23 35	21 32	117	R H C	
69	M	139	33 66	73 47	141 75	14 81	21 65	19 70	14 17	53 32	8 40	1 94	20 91	19 02	18 15	V C	
	25		32 07	72 25	139 34	14 47	20 83	18 90	13 37	52 54	6 57	1 77	18 47	16 72	154 85	O S H C	
	75		33 12	73 82	141 80	15 04	21 89	20 57	14 56	54 13	9 23	1 99	22 37	20 86	108	R H C	
52	M	136	31 82	73 53	139 33	14 75	21 34	19 70	13 60	53 18	8 00	1 83	20 00	18 89	16 02	V C	
	25		30 52	71 24	136 86	14 46	20 79	18 83	12 64	52 23	6 77	1 67	17 63	16 92	148 83	O S H C	
	75		31 36	72 17	137 33	14 86	21 50	20 01	14 35	53 84	8 75	1 76	19 96	18 10	079	R H C	
48	M	133	29 09	70 63	133 33	14 50	20 75	18 88	13 65	52 80	7 00	1 51	17 90	15 78	11 42	V C	
	25		26 82	69 09	129 33	14 14	20 00	17 75	12 95	51 76	5 25	1 26	15 84	13 46	143 64	O S H C	
Total																V C	Mean

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line, the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61

ANTHROPOMETRIC TABLE

for BOYS FOURTEEN (14) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of four hundred and thirty-five Nebraska school children.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS		
															R H C—Respiratory—Height Coefficient V C—Vitality Coefficient O S H C—Organic Strength—Height Coefficient		
	75		60 11	89 25	175 69	15 53	26 38	25 09	17 86	56 54	10 72	3 68	41 92	45 30	189	R H C	
35	M	164	54 77	87 07	171 75	15 18	25 30	23 47	16 35	55 50	9 44	3 29	38 75	36 45	40 09	V C	
	25		49 43	84 89	167 81	14 83	24 22	21 85	14 84	54 46	8 16	2 90	35 58	27 60	211 67	O S H C	
	75		52 39	84 93	167 06	15 33	25 33	23 74	16 87	56 04	10 33	2 98	36 32	33 56	140	R H C	
30	M	160	48 50	83 00	163 25	15 07	23 90	22 26	15 90	54 83	8 50	2 64	31 90	28 86	26 70	V C	
	25		44 61	81 07	159 44	14 81	22 47	20 78	14 93	53 62	6 67	2 30	27 48	24 16	190 37	O S H C	
	75		47 32	82 02	164 18	15 53	24 91	22 90	16 97	56 10	11 23	2 86	33 56	29 81	164	R H C	
48	M	156	45 50	80 70	160 80	15 10	23 78	22 00	15 87	55 00	9 70	2 64	29 73	26 81	30 85	V C	
	25		43 68	79 38	157 42	14 67	22 65	21 10	14 77	53 90	8 17	2 42	25 90	23 81	187 92	O S H C	
	75		45 36	80 41	158 99	15 27	24 13	22 78	16 48	54 98	9 46	2 65	31 80	29 59	123	R H C	
79	M	152	42 33	78 84	156 33	14 91	23 15	21 71	15 16	54 13	7 91	2 37	27 38	25 08	21 75	V C	
	25		39 30	77 27	153 67	14 55	22 17	20 64	13 84	53 28	6 36	2 09	22 96	20 57	176 37	O S H C	
	75		41 60	79 06	154 65	15 29	23 89	21 60	16 15	55 34	10 71	2 64	27 60	26 90	144	R H C	
80	M	148	39 46	77 53	151 86	14 91	22 75	20 57	14 90	54 30	9 01	2 37	25 00	23 03	24 39	V C	
	25		37 32	76 00	149 07	14 53	21 61	19 54	13 65	53 26	7 31	2 10	22 40	19 16	169 05	O S H C	
	75		39 06	77 33	149 42	15 16	23 20	21 69	16 06	54 72	9 64	2 31	25 48	24 76	122	R H C	
78	M	144	36 85	76 05	147 00	14 82	22 56	20 59	14 80	53 85	8 20	2 14	23 15	22 04	20 55	V C	
	25		34 64	74 77	144 58	14 48	21 92	19 49	13 54	52 98	6 76	1 97	20 82	19 32	168 63	O S H C	
	75		36 38	75 82	146 19	14 99	22 61	21 49	15 60	54 13	9 87	2 10	25 59	22 85	115	R H C	
49	M	140	34 74	74 40	144 50	14 68	22 08	20 45	14 25	53 30	8 46	1 91	22 79	20 64	18 59	V C	
	25		33 10	72 98	142 81	14 37	21 55	19 41	12 90	52 47	7 05	1 72	19 99	18 43	161 04	O S H C	
	75		32 35	73 62	140 40	14 96	22 15	20 35	14 82	54 09	9 15	1 87	21 23	21 47	104	R H C	
36	M	136	30 76	72 14	138 00	14 63	21 90	19 20	13 87	53 10	8 00	1 76	18 57	18 86	15 39	V C	
	25		29 17	70 66	135 60	14 30	20 25	18 05	12 92	52 11	6 85	1 65	15 91	16 25	148 61	O S H C	
Total 435		151 02	39 73	78 06	152 43	14 89	22 78	21 00	15 07	54 19	8 46	2 30	25 37	23 05	V C 21 97	Mean measurements for the age.	

Measurements of.....

taken..... 19..... by.....

ANTHROPOMETRIC TABLE

for BOYS FIFTEEN (15) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of three hundred and twenty-seven Nebraska school children.)

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS	
	75		64 54	92 02	181 77	15 53	27 50	25 80	18 78	57 16	13 09	3 84	47 60	45 00	223	R H C
26	M	170	60 45	89 83	178 33	15 30	26 00	24 30	17 65	56 13	10 75	3 52	36 97	34 54	52 21	V C
	25		56 36	87 64	174 89	15 07	24 50	22 80	16 52	55 10	8 41	3 20	26 34	24 08	234 55	O S H C
	75		57 31	89 11	177 19	15 55	26 27	24 28	18 32	56 14	11 56	3 44	42 42	40 43	171	R H C
39	M	166	54 43	86 58	172 56	15 13	25 27	23 05	17 34	55 14	9 00	3 15	37 00	35 00	37 70	V C
	25		51 55	84 05	167 93	14 71	24 27	21 82	16 36	54 14	6 44	2 86	31 58	29 57	220 76	O S H C
	75		55 88	86 72	169 75	15 48	25 58	23 99	19 01	56 34	10 62	3 57	40 28	38 38	166	R H C
46	M	163	52 95	85 00	166 00	15 08	24 60	22 90	17 43	55 30	8 67	3 11	34 32	32 36	36 16	V C
	25		50 02	83 28	162 25	14 68	23 62	21 81	15 85	54 26	6 72	2 65	28 36	26 34	217 20	O S H C
	75		52 51	85 01	164 35	15 31	25 13	23 93	17 80	55 49	10 23	3 13	37 03	33 12	151	R H C
49	M	158	48 98	83 31	162 63	15 08	24 08	22 35	16 43	54 58	8 50	2 80	33 33	28 11	39 28	V C
	25		45 45	81 61	160 91	14 85	22 99	20 77	15 06	53 67	6 77	2 47	27 73	23 10	201 03	O S H C
	75		47 33	82 49	161 00	15 16	24 65	22 94	16 83	55 38	10 20	2 73	32 27	29 56	135	R H C
57	M	154	44 54	80 92	158 75	14 88	23 63	21 81	15 80	54 54	8 36	2 49	28 03	25 68	25 50	V C
	25		41 75	79 35	156 50	14 60	22 61	20 68	14 77	53 70	6 52	2 25	23 79	21 80	188 62	O S H C
	75		43 75	80 40	154 98	15 28	23 48	22 21	16 62	55 07	9 63	2 69	30 72	27 10	141	R H C
33	M	150	41 59	79 00	153 00	14 90	22 90	21 27	15 25	54 07	8 50	2 48	27 77	24 77	24 36	V C
	25		39 43	77 60	151 02	14 52	22 32	20 33	13 88	53 07	7 37	2 27	44 82	22 44	173 34	O S H C
	75		41 21	78 09	152 39	15 15	23 02	22 41	16 13	54 86	9 79	2 52	29 40	26 72	122	R H C
41	M	146	38 68	76 94	149 75	14 87	22 46	21 30	15 15	54 03	8 19	2 17	26 51	23 24	21 26	V C
	25		36 15	75 79	147 11	14 59	21 90	20 19	14 17	53 20	6 59	1 82	23 62	19 76	174 69	O S H C
	75		37 34	76 45	148 56	14 75	23 79	21 21	15 15	54 59	9 53	2 33	24 98	23 18	109	R H C
33	M	142	35 68	74 61	145 31	14 41	22 65	20 90	14 37	53 34	7 75	1 99	20 76	20 45	17 86	V C
	25		34 02	72 77	142 06	14 07	21 51	19 59	13 59	52 09	5 97	1 65	16 54	17 72	164 41	O S H C
Total															V C	Mean

Directions for Plotting.

Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
. . The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
. . Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61

R H C—Respiratory—Height Coefficient
V C—Vitality Coefficient
O S H C—Organic Strength—Height Coefficient

ANTHROPOMETRIC TABLE

for BOYS SIXTEEN (16) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the measurements of two hundred and eighteen Omaha school children.)

Number of Observations	Per Cent.	Height (centimetres)	Weight (Kilos.)	LENGTHS (CENT.) Height Sitting	LENGTHS (CENT.) Span of Arms	BREADTHS (CENT.) Head	BREADTHS (CENT.) Chest	BREADTHS (CENT.) Waist	DEPTH (CENT.) Chest	GIRTHS (CENT.) Girth of Head	GIRTHS (CENT.) Chest Expansion	STRENGTHS Lung Capacity (litres.)	STRENGTHS Strength of Forearm, R (Kilos.)	STRENGTHS Strength of Forearm, L (Kilos.)	COEFFICIENTS	
	75		67 73	94 33	186 30	15 90	27 60	25 94	19 24	57 33	11 08	4 13	41 02	43 18	206	R H C
25	M	173	64 09	91 25	182 13	15 62	26 55	24 90	18 10	56 48	9 40	3 79	37 27	36 36	50 58	V C
	25		60 45	88 17	177 96	15 34	25 50	23 86	16 96	55 63	7 72	3 45	33 52	29 54	245 60	O S H C
	75		61 21	90 89	180 10	15 56	26 45	25 60	19 06	56 57	10 79	3 95	49 21	44 61	201	R H C
25	M	170	58 07	89 42	176 38	15 25	25 65	24 10	18 10	55 70	9 45	3 61	37 73	34 32	47 54	V C
	25		54 93	87 95	172 66	14 94	24 85	22 60	17 14	54 83	8 11	3 27	26 25	24 03	236 92	O S H C
	75		61 02	89 16	174 88	15 67	27 00	24 83	17 95	57 00	11 36	3 83	45 45	43 37	191	R H C
24	M	167	56 36	87 33	172 75	15 30	26 00	23 73	17 40	56 00	9 50	3 36	38 18	36 55	43 25	V C
	25		51 70	85 50	170 62	14 93	25 00	22 63	16 85	55 00	7 64	2 89	30 91	29 73	226 25	O S H C
	75		57 27	87 09	172 32	15 96	26 33	24 96	18 19	56 35	10 27	3 43	36 86	35 11	164	R H C
31	M	164	55 00	85 72	169 50	15 43	25 10	23 55	17 05	55 15	8 57	3 13	29 55	29 09	35 46	V C
	25		52 73	84 35	166 68	14 90	23 87	22 12	15 91	53 95	6 87	2 83	22 24	23 07	216 78	O S H C
	75		55 60	86 92	168 75	15 57	25 64	24 27	17 34	55 74	10 49	3 52	42 46	39 32	178	R H C
36	M	161	52 88	85 00	165 75	15 10	24 66	23 00	16 20	55 00	9 00	3 18	36 82	32 73	36 98	V C
	25		50 16	83 08	162 75	14 63	23 68	21 73	15 06	54 26	7 51	2 84	31 18	26 14	208 01	O S H C
	75		49 85	85 29	167 85	15 25	25 07	24 05	17 53	55 15	11 13	3 29	38 18	33 26	161	R H C
25	M	158	47 12	83 75	164 25	15 01	24 00	22 80	16 40	54 40	8 88	2 87	33 52	28 94	32 81	V C
	25		44 39	82 21	160 65	14 77	22 93	21 55	15 27	53 65	6 63	2 45	28 86	24 62	203 42	O S H C
	75		46 59	82 59	160 58	15 28	24 45	23 60	17 24	55 15	11 17	2 80	32 27	31 90	141	R H C
20	M	155	44 09	80 67	158 33	14 90	23 35	22 60	16 40	53 90	8 70	2 51	28 18	27 50	27 00	V C
	25		41 59	78 75	156 08	14 52	22 25	21 60	15 56	52 65	6 23	2 22	24 09	23 10	191 64	O S H C
	75		42 73	80 63	159 45	15 18	24 40	22 56	16 65	55 37	9 35	2 59	33 75	30 82	123	R H C
32	M	152	40 00	78 33	151 75	14 84	23 50	21 30	15 30	54 37	8 07	2 32	28 64	26 14	21 75	V C
	25		37 27	76 03	144 05	14 50	22 60	20 04	13 95	53 37	6 79	2 05	23 53	21 46	176 61	O S H C
Total 218		163 73	52 90	85 21	168 21	15 14	25 04	23 19	16 80	54 73	8 80	3 14	33 31	29 64	V C 35 58	Mean measurements

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches multiply by .393; kilogrammes to pounds multiply by 2.2; litres to cubic inches multiply by 61.

R H C—Respiratory—Height Coefficient
V C—Vitality Coefficient
O S H C—Organic Strength—Height Coefficient

ANTHROPOMETRIC TABLE

for BOYS SEVENTEEN (17) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the *net* measurements of five hundred and twelve Nebraska, Massachusetts, and Connecticut school boys.)

Number of Observations	Per Cent.	Height	Weight	LENGTHS		BREADTHS			DEPTH	GIRTHS		STRENGTHS			COEFFICIENTS		
				Height Sitting	Span of Arms	Head	Chest	Waist	Chest	Head	Chest Expansion	Lung Capacity	Forearm, Right	Forearm, Left	R H C — Respiratory-Height Coefficient V C — Vitality Coefficient O S H C — Organic Strength-Height Coefficient		
	75		68 01	94 45	187 94	15 90	28 70	26 21	20 17	57 85	9 47	4 72	52 34	54 71	187	R H C	
50	M	178	63 56	93 61	184 75	15 65	27 25	25 72	19 03	57 00	7 73	4 34	46 21	45 45	49 13	V C	
	25		59 11	92 77	181 56	15 40	25 80	25 23	17 89	56 15	5 99	3 96	40 08	36 19	262 84	O S H C	
	75		65 84	92 94	183 27	15 88	27 21	26 90	19 93	57 83	9 16	4 42	56 13	51 05	169	R H C	
83	M	175	62 39	91 85	181 42	15 35	26 17	26 10	19 05	56 75	7 54	3 95	46 36	42 73	43 72	V C	
	25		58 94	90 76	179 57	14 82	25 13	25 30	18 17	55 67	5 92	3 48	36 59	34 41	259 09	O S H C	
	75		62 11	91 98	179 38	15 73	26 55	26 56	19 36	57 68	8 79	4 36	50 45	44 54	166	R H C	
72	M	172	58 64	90 50	176 75	15 28	25 50	25 45	18 46	56 75	7 35	3 93	43 18	38 18	40 84	V C	
	25		55 17	89 02	174 12	14 83	24 45	24 34	17 56	55 82	5 91	3 50	35 91	31 82	245 30	O S H C	
	75		61 67	90 86	177 40	15 65	27 02	26 00	19 28	56 93	9 13	3 95	47 50	43 52	161	R H C	
70	M	169	57 14	88 92	175 30	15 28	25 60	24 66	18 28	55 85	7 60	3 61	41 14	36 97	38 56	V C	
	25		52 61	86 98	173 20	14 91	24 18	23 32	17 28	54 77	6 07	3 27	34 78	30 42	239 58	O S H C	
	75		59 82	89 18	175 35	15 74	26 62	25 94	18 92	56 50	8 75	3 78	48 90	41 81	147	R H C	
84	M	166	55 97	87 20	172 50	15 38	25 48	24 60	17 97	55 53	7 10	3 46	40 46	36 36	34 43	V C	
	25		52 12	85 22	169 65	15 02	24 34	23 26	17 02	54 56	5 45	3 14	32 02	30 91	234 25	O S H C	
	75		57 24	87 80	172 12	15 74	26 05	24 83	18 79	57 36	8 53	3 69	40 98	37 65	142	R H C	
72	M	163	53 18	86 17	169 40	15 25	25 15	23 73	18 06	56 05	7 06	3 30	37 12	32 50	32 83	V C	
	25		49 12	84 54	166 68	14 76	24 25	22 63	17 33	54 74	5 59	2 91	33 26	27 35	231 21	O S H C	
	75		52 86	85 38	170 50	15 48	25 85	23 91	17 85	56 24	7 55	3 70	44 69	38 00	129	R H C	
37	M	160	49 88	84 44	167 25	15 20	24 78	23 13	16 92	55 60	6 50	3 21	36 36	32 50	27 38	V C	
	25		46 90	83 50	163 91	14 92	23 71	22 35	15 99	54 96	5 45	2 72	28 03	27 00	211 92	O S H C	
	75		50 55	84 50	165 50	15 35	24 68	24 69	17 35	55 95	7 85	3 07	35 90	36 89	107	R H C	
44	M	157	45 45	82 50	159 00	15 05	23 67	22 60	16 40	55 05	6 35	2 68	28 63	31 97	21 20	V C	
	25		40 35	80 50	152 50	14 75	22 66	20 51	15 55	54 15	4 85	2 29	21 36	27 05	197 48	O S H C	
Total															V C	Mean	

Directions for Plotting.

Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line; the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent line.
Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches, multiply by .393; kilogrammes to pounds, multiply by 2.2; litres to cubic inches, multiply by 61.

ANTHROPOMETRIC TABLE

for BOYS EIGHTEEN (18) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the *net* measurements of seven hundred and twenty-three Nebraska, Massachusetts, and Connecticut school boys.)

Number of Observations	Per Cent.	Height	Weight	LENGTHS		BREADTHS			DEPTH	GIRTHS		STRENGTHS			COEFFICIENTS		
				Height Sitting	Span of Arms	Head	Chest	Waist	Chest	Head	Chest Expansion	Lung Capacity	Forearm, Right	Forearm, Left	R H C — Respiratory-Height Coefficient V C — Vitality Coefficient O S H C — Organic Strength-Height Coefficient		
	75		70 32	94 75	192 84	16 11	28 37	27 03	20 98	58 40	9 31	4 87	54 32	50 90	192	R H C	
58	M	180	66 27	93 00	189 25	15 85	27 00	25 70	19 84	57 40	7 78	4 47	49 32	45 45	51 33	V C	
	25		62 22	91 25	185 66	15 59	25 63	24 37	18 70	56 40	6 25	4 07	44 32	40 00	267 87	O S H C	
	75		69 12	92 70	188 50	16 31	27 96	26 42	19 91	57 33	9 19	4 76	54 89	50 46	185	R H C	
66	M	177	64 32	91 00	186 00	15 73	26 85	25 37	19 11	56 13	7 72	4 27	50 00	45 23	46 98	V C	
	25		59 52	89 30	183 50	15 15	25 74	24 32	18 31	54 93	6 25	3 78	45 11	40 00	254 37	O S H C	
	75		66 37	93 02	185 50	15 91	28 02	26 46	19 63	57 99	9 95	4 34	57 12	50 79	184	R H C	
112	M	174	62 73	91 70	182 75	15 57	26 78	25 63	18 63	56 80	8 02	4 02	51 02	46 02	46 86	V C	
	25		59 09	90 38	180 00	15 23	25 51	24 80	17 63	55 61	6 09	3 70	44 92	41 25	253 09	O S H C	
	75		65 38	91 19	180 15	15 79	27 37	26 32	19 90	57 56	8 99	4 32	52 22	49 59	174	R H C	
124	M	171	60 78	90 00	177 40	15 38	26 04	25 00	18 97	56 66	7 64	3 93	47 84	45 60	43 96	V C	
	25		56 18	88 81	174 65	14 97	24 71	23 68	18 04	55 76	6 29	3 54	43 46	41 61	252 58	O S H C	
	75		60 95	90 29	180 35	15 79	26 67	25 82	19 17	56 66	8 89	3 98	52 88	50 04	160	R H C	
145	M	168	57 27	88 88	176 75	15 41	25 51	24 90	18 29	55 47	7 49	3 62	47 27	43 45	38 67	V C	
	25		53 59	87 47	173 15	15 03	24 35	23 98	17 41	54 28	6 09	3 26	41 66	36 86	241 73	O S H C	
	75		57 71	88 39	173 09	15 53	26 38	24 55	19 06	57 31	9 10	3 80	48 11	45 39	152	R H C	
80	M	165	54 24	86 89	171 21	15 29	25 40	23 75	18 21	55 98	7 40	3 43	43 36	38 74	35 46	V C	
	25		50 77	85 39	169 33	15 05	24 42	22 95	17 36	54 65	5 70	3 06	38 61	32 09	232 59	O S H C	
	75		57 56	88 91	172 69	15 53	26 16	24 35	18 97	57 04	9 08	3 69	46 50	45 81	149	R H C	
85	M	162	54 36	86 50	168 38	15 38	25 41	23 65	18 08	56 47	7 23	3 38	41 67	41 36	35 07	V C	
	25		51 16	84 09	164 07	15 23	24 66	22 95	17 19	55 90	5 38	3 07	36 84	36 91	234 63	O S H C	
	75		56 23	86 88	169 57	15 32	26 00	24 39	18 97	56 63	8 43	3 67	45 23	39 90	145	R H C	
53	M	159	53 13	84 00	163 25	14 83	25 03	23 60	18 22	55 20	7 13	3 26	39 09	33 86	33 58	V C	
	25		50 03	81 12	156 93	14 34	24 06	22 81	17 47	53 77	5 83	2 85	32 95	27 82	231 86	O S H C	
Total																V C	Mean

Directions for Plotting.

Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line; the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent line.
Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches, multiply by .393; kilogrammes to pounds, multiply by 2.2; litres to cubic inches, multiply by 61.

ANTHROPOMETRIC TABLE

for BOYS NINETEEN (19) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the *net* measurements of seven hundred and ninety-six Nebraska, Massachusetts, and Connecticut school boys.)

Number of Observations	Per Cent.	Height	Weight	LENGTHS		BREADTHS			DEPTH	GIRTHS		STRENGTHS			COEFFICIENTS		
				Height Sitting	Span of Arms	Head	Chest	Waist	Chest	Head	Chest Expansion	Lung Capacity	Forearm, Right	Forearm, Left	R H C — Respiratory-Height Coefficient V C — Vitality Coefficient O S H C — Organic Strength-Height Coefficient		
	75		73 42	97 05	194 25	16 24	28 30	27 10	20 04	58 60	10 10	5 13	58 55	55 68	214	R H C	
58	M	182	67 61	94 00	191 50	15 78	27 00	26 15	19 10	57 50	8 45	4 65	54 91	51 82	55 68	V C	
	25		61 80	90 95	188 75	15 32	25 70	25 20	18 16	56 40	6 80	4 17	51 27	47 96	260 02	O S H C	
	75		68 83	95 13	189 50	16 25	28 38	26 90	20 37	58 25	9 95	4 84	59 59	52 72	207	R H C	
77	M	179	65 11	93 63	187 00	15 90	27 13	25 80	19 26	57 30	8 35	4 47	54 82	47 95	54 67	V C	
	25		61 39	92 13	184 50	15 55	25 88	24 70	18 15	56 35	6 75	4 10	50 05	43 18	264 40	O S H C	
	75		67 98	94 28	188 00	16 16	27 83	26 74	19 96	57 91	10 34	4 58	55 56	50 20	196	R H C	
92	M	176	64 09	92 36	183 00	15 70	26 76	25 45	19 01	57 03	8 35	4 17	50 80	45 00	50 65	V C	
	25		60 20	90 44	178 00	15 24	25 69	24 16	18 06	56 15	6 36	3 76	46 04	39 80	258 22	O S H C	
	75		66 05	91 83	182 23	15 73	27 59	27 09	19 30	58 04	9 31	4 43	57 63	53 94	18	R H C	
129	M	173	61 93	90 41	179 10	15 38	26 67	25 80	18 59	57 20	7 74	4 10	50 36	47 05	45 95	V C	
	25		57 81	88 99	175 97	15 03	25 75	24 51	17 88	56 36	6 17	3 77	43 09	40 16	252 69	O S H C	
	75		64 70	90 86	180 61	16 11	27 99	26 39	19 78	58 27	9 26	4 33	50 44	49 76	178	R H C	
131	M	170	60 60	89 70	177 33	15 75	26 66	25 47	18 63	57 20	7 68	3 98	46 32	44 09	45 27	V C	
	25		56 50	88 54	174 05	15 39	25 33	24 55	17 48	56 13	6 10	3 63	42 20	38 42	253 98	O S H C	
	75		62 84	90 46	177 50	16 13	27 45	26 47	19 33	58 75	9 00	4 26	50 37	44 96	176	R H C	
135	M	167	58 91	88 71	174 75	15 75	26 05	25 18	18 46	57 40	7 62	3 89	45 91	40 83	43 79	V C	
	25		54 98	86 96	172 00	15 37	24 65	23 89	17 59	56 05	6 24	3 52	41 45	36 70	248 94	O S H C	
	75		60 17	89 17	170 96	15 68	26 59	25 97	19 25	56 95	8 67	3 97	47 90	46 07	155	R H C	
102	M	164	56 95	88 00	168 30	15 30	25 68	25 23	18 33	56 20	7 08	3 63	43 18	40 76	38 53	V C	
	25		53 73	86 83	165 64	14 92	24 77	24 49	17 41	55 45	5 49	3 29	38 46	35 45	248 10	O S H C	
	75		56 75	88 64	170 50	15 72	26 72	26 60	18 93	57 08	7 79	3 84	47 38	46 58	150	R H C	
72	M	161	52 67	86 30	165 75	15 33	25 47	25 25	18 00	56 20	6 98	3 49	43 18	40 00	36 34	V C	
	25		48 59	83 96	161 00	14 94	24 22	23 90	17 07	55 32	6 17	3 14	38 98	33 42	242 43	O S H C	
Total 796		171 81	61 71	90 39	177 61	15 75	27 35	25 70	19 03	57 03	8 40	4 10	47 55	43 64	V C 53 23	Mean measurements for the age.	

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent line may be regarded as the 90 per cent. line; the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

All measurements are given in the Metric System. To transpose centimetres to inches, multiply by .393; kilogrammes to pounds, multiply by 2.2; litres to cubic inches, multiply by 61.

Measurements of.....

taken.....19..... by.....

ANTHROPOMETRIC TABLE

for BOYS TWENTY (20) YEARS OF AGE

PHYSICAL TYPE FOR EACH HEIGHT OF THE AGE, AND VITALITY COEFFICIENTS.

(Compiled from the *net* measurements of seven hundred and thirty-six Nebraska, Massachusetts, and Connecticut school boys.)

Directions for Plotting.

1. Place dots to left of figures. 2. Regard middle of spaces as 25, 50 and 75 per cent. lines.
3. The upper line of the two enclosing the 75 per cent. line may be regarded as the 90 per cent. line; the lower line of the two enclosing the 25 per cent. line may be regarded as the 10 per cent line.
4. Should a measurement differ from the 75 per cent. line above or the 25 per cent. line below to the amount of the average corrected deviation, the point should be placed just outside the lines enclosing 75 per cent. and 25 per cent. grades to indicate extreme abnormality.

Number of Observations	Per Cent.	Height	Weight	LENGTHS		BREADTHS			DEPTH	GIRTHS		STRENGTHS			COEFFICIENTS		
				Height Sitting	Span of Arms	Head	Chest	Waist	Chest	Head	Chest Expansion	Lung Capacity	Forearm, Right	Forearm, Left	R H C — Respiratory-Height Coefficient V C — Vitality Coefficient O S H C — Organic Strength-Height Coefficient		
	75		81 64	99 50	194 38	16 02	29 46	27 25	21 13	59 18	9 80	5 15	56 81	56 20	220	R H C	
29	M	184	74 77	96 00	190 50	15 85	28 10	26 40	20 22	57 60	8 35	4 88	53 63	51 82	62 64	V C	
	25		67 90	92 50	186 62	15 68	26 74	25 55	19 31	56 02	6 90	4 61	50 45	47 44	285 15	O S H C	
	75		70 28	93 51	189 13	16 19	28 30	27 67	20 47	58 20	10 06	4 84	67 05	58 24	196	R H C	
27	M	181	66 93	94 38	186 00	15 70	27 05	26 70	19 50	57 50	8 03	4 45	59 55	54 32	53 07	V C	
	25		63 58	93 25	182 87	15 21	25 80	25 73	18 53	56 80	6 00	4 06	52 05	50 40	271 02	O S H C	
	75		68 79	94 69	187 50	16 09	28 13	27 32	20 21	58 38	9 42	4 82	53 53	50 50	195	R H C	
79	M	178	65 18	93 00	184 67	15 70	26 95	26 23	19 28	57 65	8 05	4 34	50 55	45 79	51 70	V C	
	25		61 57	91 31	181 84	15 31	25 77	25 14	18 35	56 92	6 68	3 86	47 57	41 08	265 61	O S H C	
	75		67 27	94 68	186 17	15 96	27 95	27 28	19 49	58 36	9 67	4 69	57 63	51 86	185	R H C	
99	M	175	63 68	93 07	182 50	15 53	26 76	26 33	18 60	57 33	7 76	4 20	50 23	46 06	48 08	V C	
	25		60 09	91 46	178 83	15 10	25 57	25 38	17 71	56 30	5 85	3 71	42 83	40 26	260 35	O S H C	
	75		64 76	92 59	182 59	15 85	27 82	27 60	19 55	58 27	9 13	4 55	54 70	48 10	180	R H C	
138	M	172	60 45	91 17	179 83	15 53	26 67	26 67	18 64	57 23	7 74	4 03	50 45	43 48	46 96	V C	
	25		56 14	89 75	177 07	15 21	25 52	25 74	17 73	56 19	6 35	3 51	46 20	38 86	261 23	O S H C	
	75		62 80	91 01	179 67	15 89	27 71	26 82	19 31	57 67	9 26	4 22	50 40	46 63	175	R H C	
149	M	169	59 32	89 75	176 75	15 50	26 69	25 82	18 51	56 50	7 75	3 86	47 27	43 52	44 88	V C	
	25		55 84	88 49	173 83	15 11	25 67	24 82	17 71	55 33	6 24	3 50	44 11	40 41	255 82	O S H C	
	75		62 25	90 37	177 28	15 94	26 87	26 73	19 14	57 85	9 35	4 21	49 50	46 28	172	R H C	
105	M	166	59 14	89 10	174 90	15 60	25 99	25 70	18 37	56 90	7 64	3 78	46 21	43 33	43 53	V C	
	25		56 03	87 83	172 52	15 26	25 11	24 67	17 60	55 95	5 93	3 35	42 92	40 38	251 55	O S H C	
	75		58 89	88 84	170 20	15 78	26 69	25 75	19 16	56 80	8 80	3 81	48 81	43 79	155	R H C	
110	M	163	54 59	87 17	167 50	15 48	25 55	25 00	18 35	56 20	7 40	3 45	45 53	41 00	38 14	V C	
	25		50 29	85 50	164 80	15 18	24 41	24 25	17 54	55 60	6 00	3 09	42 25	38 21	245 77	O S H C	
Total 736		172 22	61 09	90 96	175 76	15 63	27 63	25 92	19 24	56 98	8 34	4 20	48 18	44 66	V C 55 34	Mean measurements for the age.	

All measurements are given in the Metric System. To transpose centimetres to inches, multiply by .393; kilogrammes to pounds, multiply by 2.2; litres to cubic inches, multiply by 61.

Measurements of.....

taken.....19..... by.....